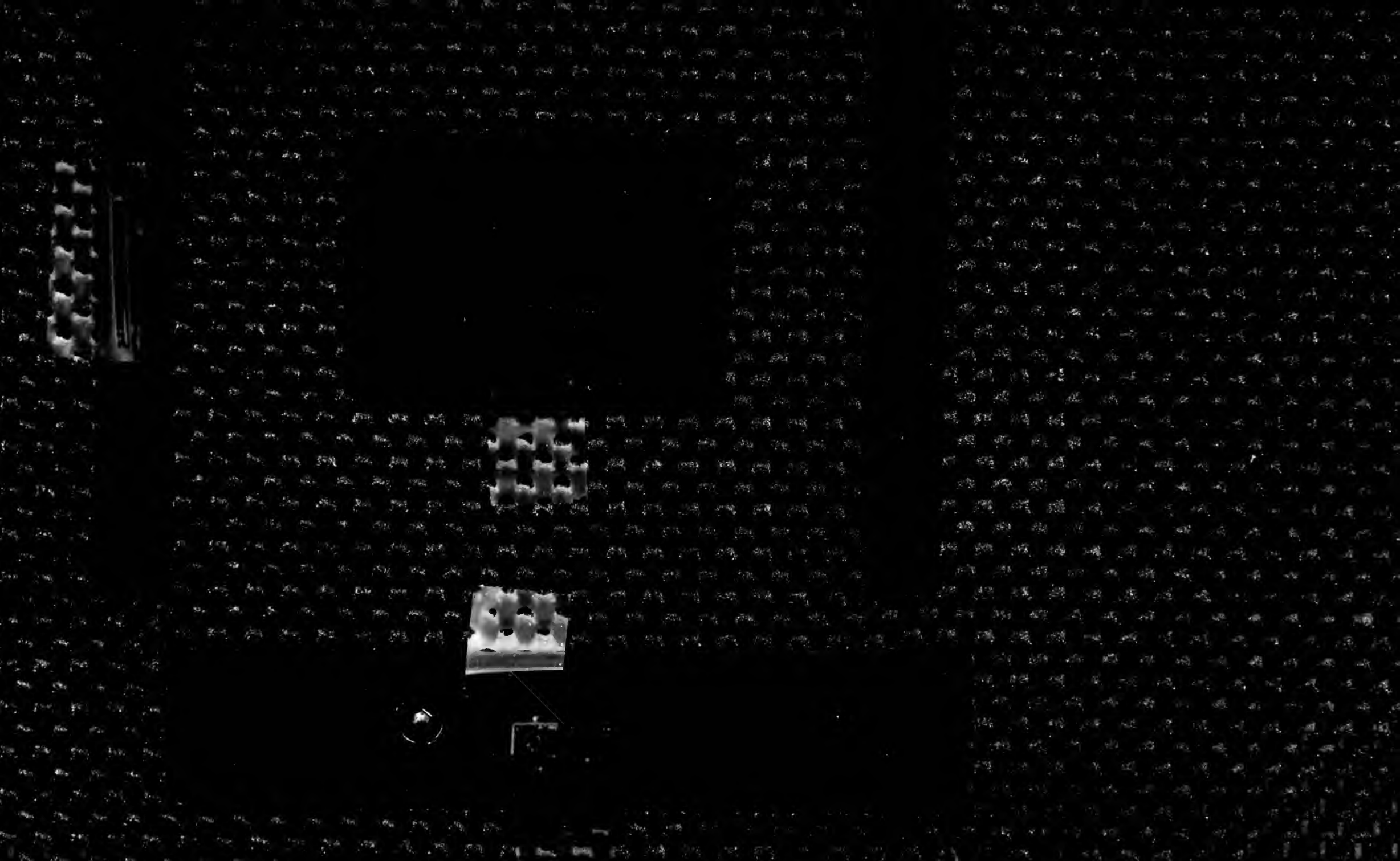


Multipurpose Dams

of the Pacific Northwest

U.S. Department of Energy
Bonneville Power Administration

Multipurpose Dams
of the Pacific Northwest

Introduction

This book is a tour in photographs of 55 hydroelectric projects in the Pacific Northwest — 30 Federal dams and 25 major non-Federal installations in the Pacific Northwest. The dams on the Columbia and its tributaries add up to the largest hydroelectric development in the world.

Some of the dams pictured in the book have been in place for more than half a century, most were built in the last two decades, but all are designed to tame and hold a river and put its energy to work for man.

One of the principal tasks of these dams is power generation — the supplying of low-cost electrical power to the people and industries of the Pacific Northwest. As power producers, dams use the hydrologic cycle, a constantly renewable resource, to slow the rate of depletion of our dwindling fossil fuels. Northwest hydropower is delivered over the transmission grid of the Bonneville Power Administration and the interconnected lines of non-Federal utilities for distribution to the consumer or for sale directly to industry.

But dams give the Northwest more than power. The harnessing of a river's falling waters also means flood control, irrigation and navigation benefits, and recreation for the public on the dams' reservoirs. Along with flood control, storage dams on the upper reaches of Northwest rivers provide for holding spring runoffs and releasing them gradually to sustain levels of power generation at site and at downstream run-of-the river projects when streamflows would ordinarily be low. A few projects, such as Big Cliff on the North Santiam River, serve to re-regulate river flows by capturing surges of water released to generate power at larger dams just upstream of the re-regulator.

The Federal dams shown here are projects of the Corps of Engineers or the Bureau of Reclamation. Non-Federal dams were constructed and are managed by private and public utilities. All major Pacific Northwest dams are interconnected by lines of the owners or through the BPA transmission grid — a network that on December 31, 1977, had more than 12,600 circuit miles of line in service.

Our tour begins at Bonneville Dam, 40 miles east of Portland. Completed in 1938 by the Corps of Engineers, Bonneville was the first Federal dam on the Columbia. Its success heralded the age of hydro power in the Northwest. Today, it is just one of many dams to feel the power of this mighty river pushing toward the Pacific.

Further upstream, past such dams as The Dalles, John Day, McNary, Rocky Reach, Wells, Chief Joseph and others, is the grandest dam of all — Grand Coulee. This massive structure was the largest power producer in the country, even before its capacity was recently doubled by the completion of a third powerhouse.

After Grand Coulee we follow the Columbia River into Canada to the Keenleyside and Mica; then up to the Kootenai River and on to Duncan; then to Libby Dam in Montana; then up to the Pend Oreille River to Boundary in Washington and Albeni Falls in northern Idaho. We continue up the Clark Fork past Noxon Rapids and Kerr Dams to Hungry Horse Dam in Montana. Then we go back to the Columbia-Snake confluence to head up the Columbia's longest tributary, the 1040-mile-long Snake River, past the lower and middle Snake dams, and on to southern Idaho. On the Snake we find the Minidoka project, completed by the Bureau of Reclamation in 1909 and thus the oldest Federal power producing dam in the United States.

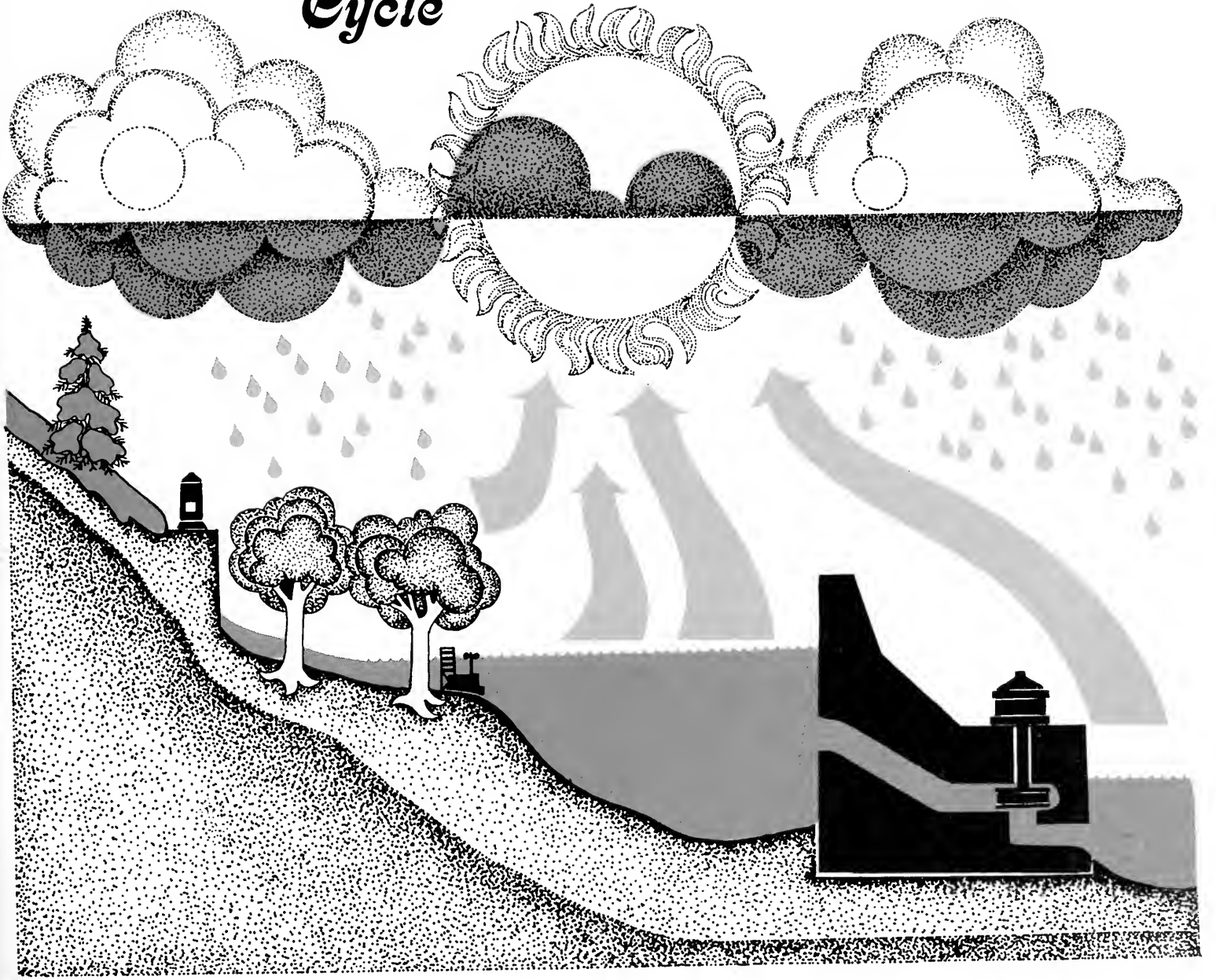
Our itinerary calls for a return to Oregon with a look at Federal dams which provide valuable flood control in the fertile Willamette Valley, and then to southwestern Washington to look at non-Federal Mossyrock on the Cowlitz River. Our trip ends outside the Columbia River Basin with the Skagit River projects in northwest Washington and the Lost Creek project on the Rogue River in southwestern Oregon.

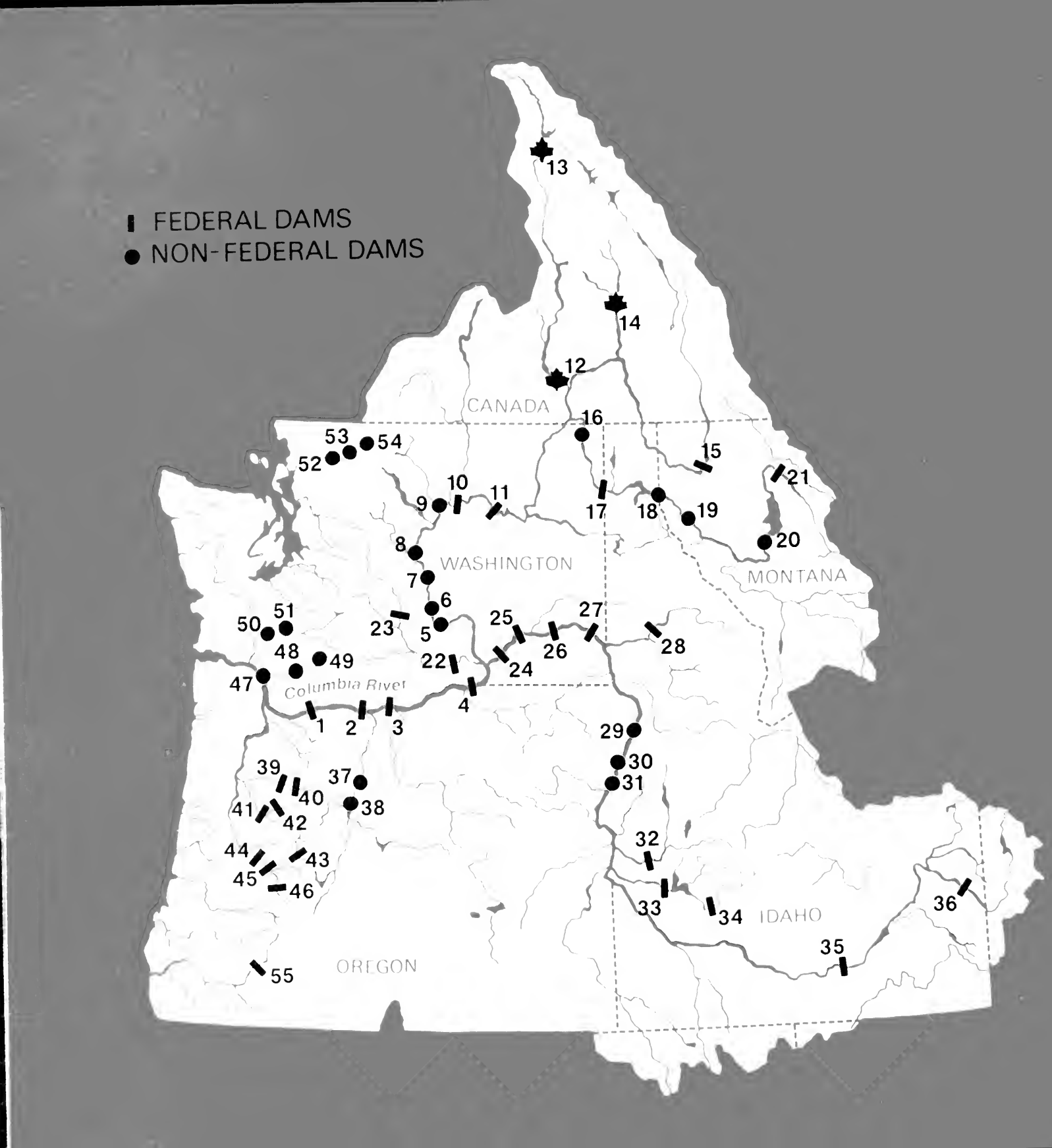
All the hydro projects in the Northwest, large or small, on mighty rivers or rushing streams, work hand-in-hand to supply the needs for electric energy in the Northwest.

Their power has helped to win wars, build industry, and make a better life for millions of people.

Today, a new era of thermal generation has begun. Coal- and nuclear-fired steamplants will meet demands for new sources of power in a growing region. But the dams, some of which will add new generating capacity in the future, will remain the strong backbone of the system for many years to come.

The Hydrologic Cycle




FEDERAL DAMS
NON-FEDERAL DAMS
CANADA
WASHINGTON
MONTANA
IDAHO
OREGON
Columbia River
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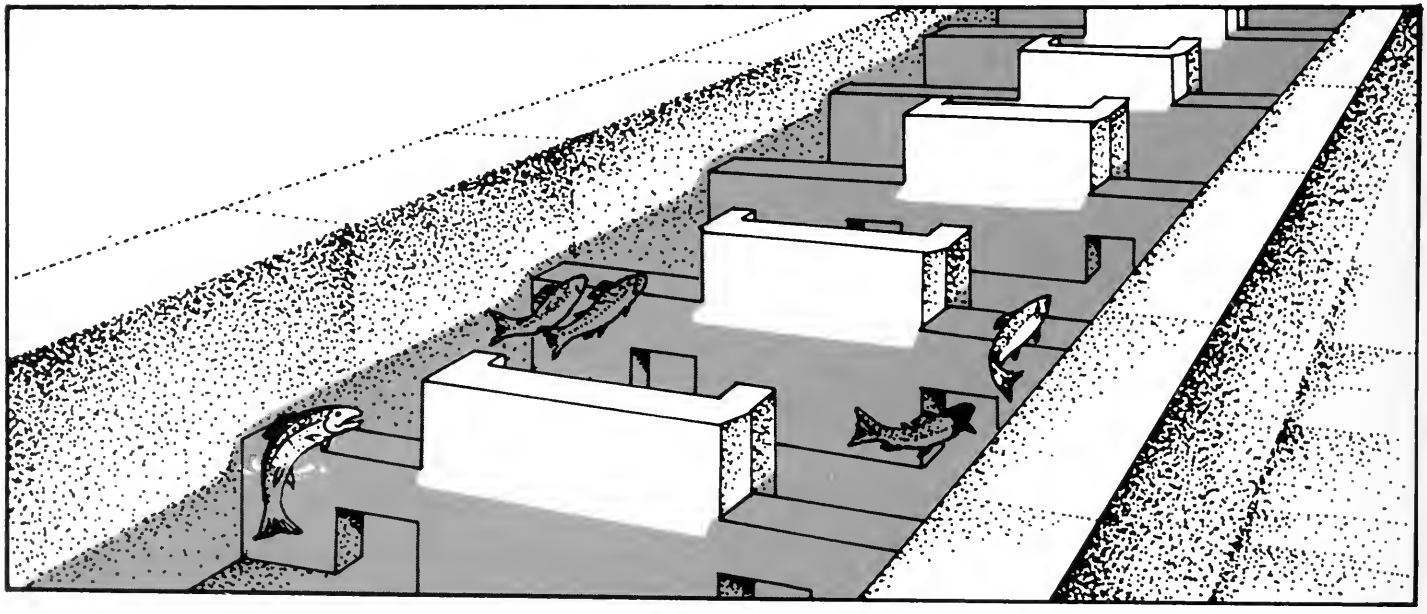
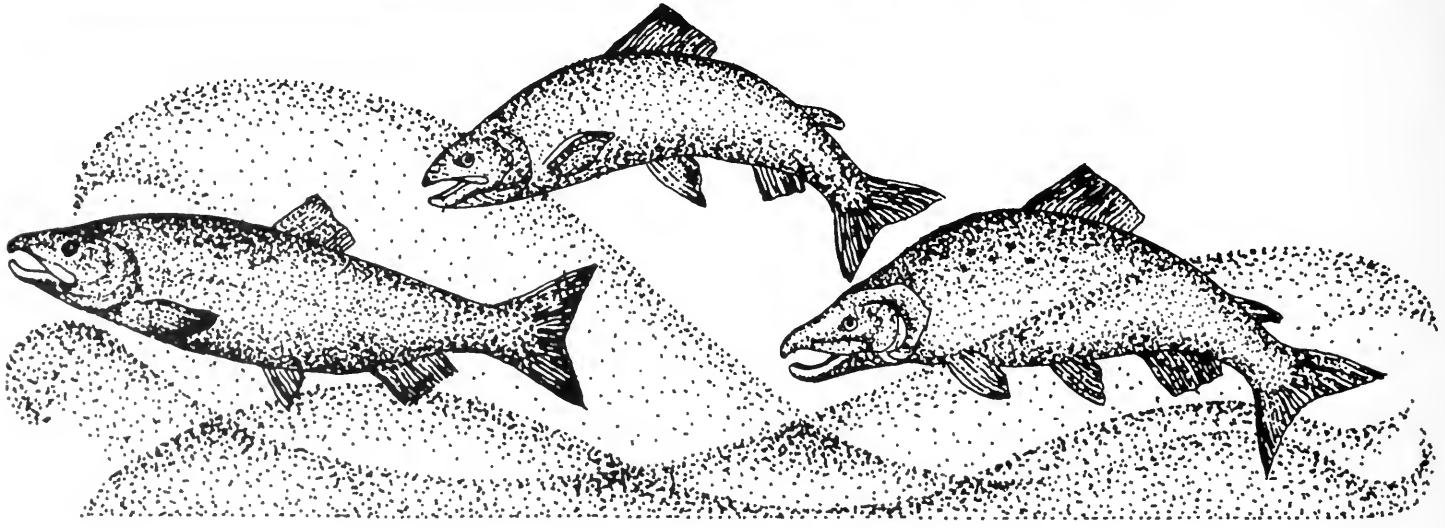
The Dams

1 BONNEVILLE
2 THE DALLES
3 JOHN DAY
4 McNARY
5 PRIEST RAPIDS
6 WANAPUM
7 ROCK ISLAND
8 ROCKY REACH
9 WELLS
10 CHIEF JOSEPH
11 GRAND COULEE
12 KEENLEYSIDE
13 MICA
14 DUNCAN
15 LIBBY
16 BOUNDARY
17 ALBENI FALLS
18 CABINET GORGE
19 NOXON RAPIDS
20 KERR
21 HUNGRY HORSE
22 CHANDLER
23 ROZA
24 ICE HARBOR
25 LOWER MONUMENTAL
26 LITTLE GOOSE
27 LOWER GRANITE
28 DWORSHAK
29 HELLS CANYON
30 OXBOW
31 BROWNLEE
32 BLACK CANYON
33 BOISE DIVERSION
34 ANDERSON RANCH
35 MINIDOKA
36 PALISADES
37 PELTON
38 ROUND BUTTE
39 BIG CLIFF
40 DETROIT
41 FOSTER
42 GREEN PETER
43 COUGAR
44 DEXTER
45 LOOKOUT POINT
46 HILLS CREEK
47 MERWIN
48 YALE
49 SWIFT
50 MAYFIELD
51 MOSSYROCK
52 GORGE
53 DIABLO
54 ROSS
55 LOST CREEK

The Fish Ladder

Leaping from pool to pool, salmon work their way up a fish ladder toward spawning beds in upper reaches of a fresh-water stream. Fish ladders enable salmon — and other fish that live in the sea but spawn in rivers — to get past dams.





Fish Ladder Bonneville Dam

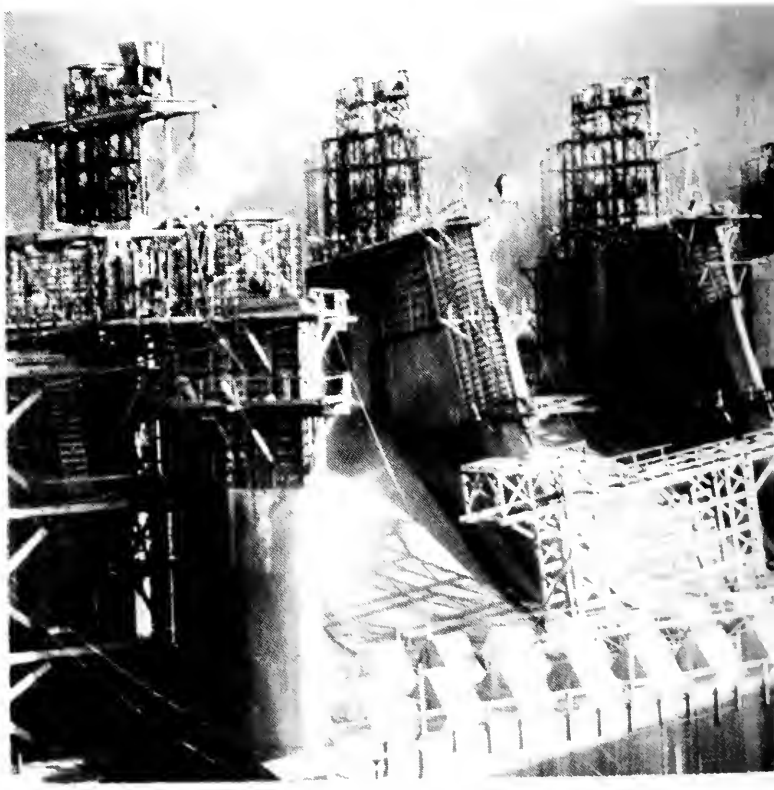
Construction of Bonneville Dam, 1936
(began 1933)

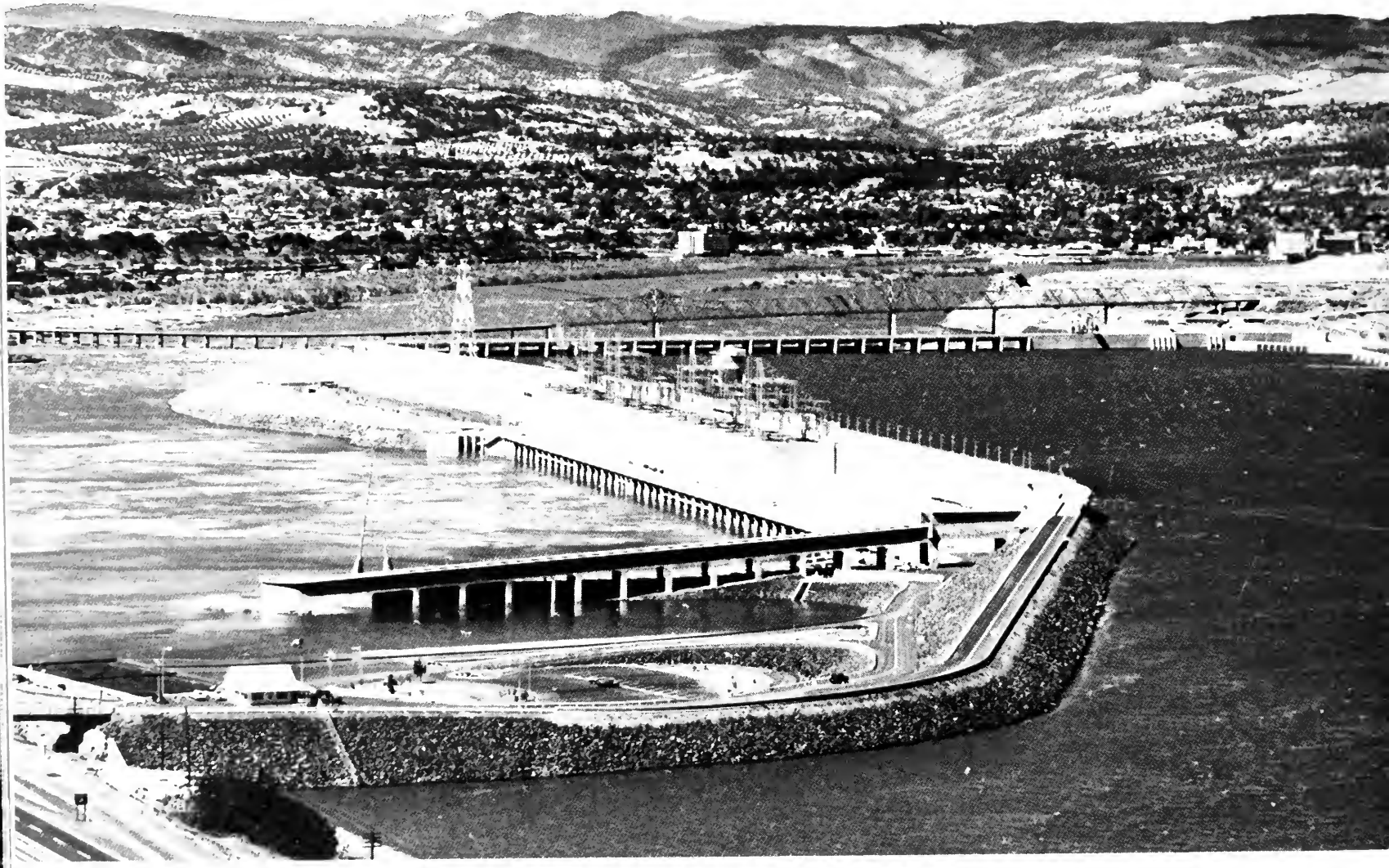
1 *Bonneville*

Columbia River, Oregon-Washington
Corps of Engineers
In service June 6, 1938
518,400 KW
Eight generating units under
construction will add 544,000 KW

PURPOSE

Power
Recreation
Navigation

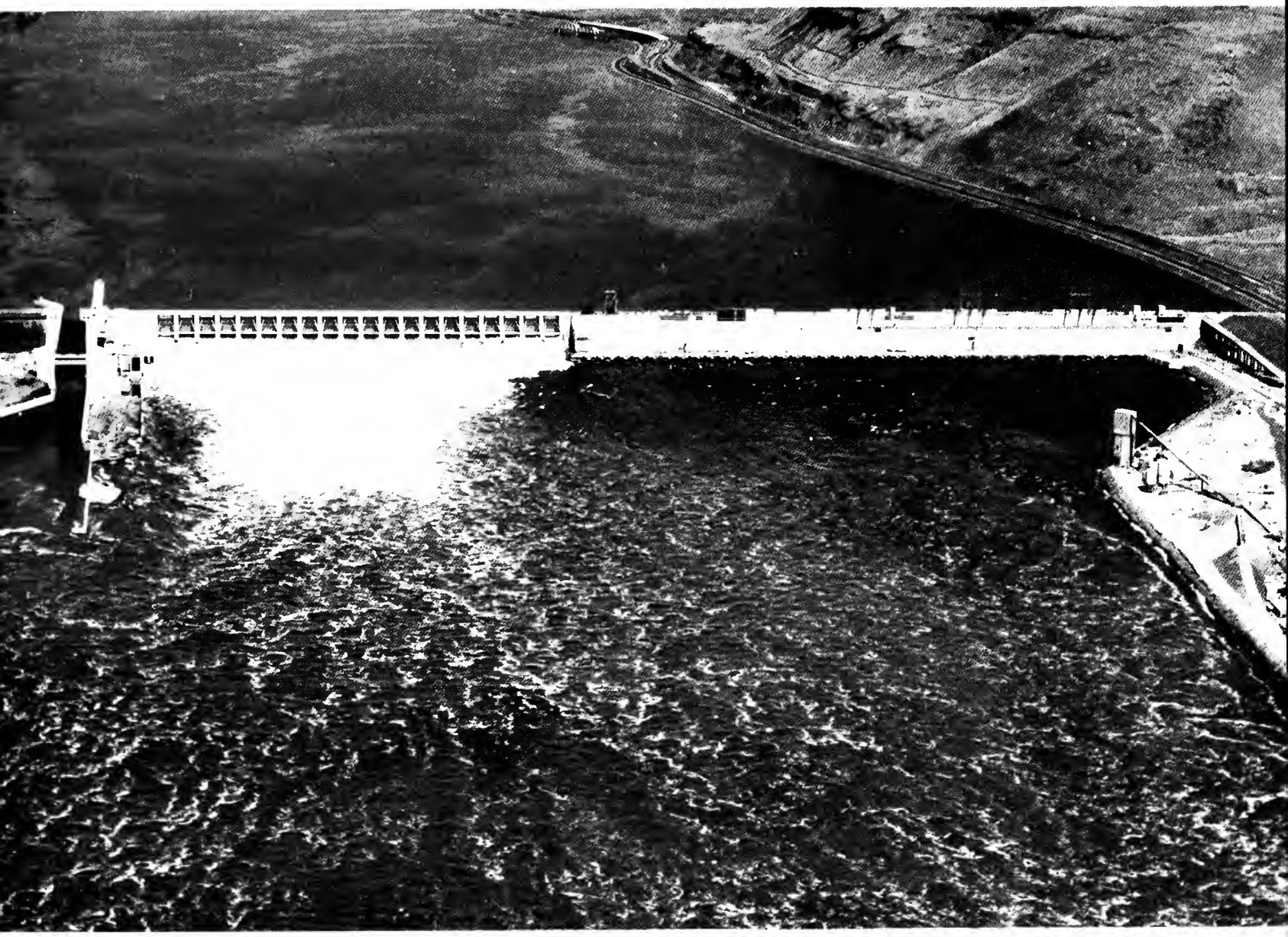




2 *The Dalles*

Columbia River, Oregon-Washington
Corps of Engineers
In service May 13, 1957
1,807,000 KW

PURPOSE
Power
Recreation
Navigation



3 John Day

Columbia River, Oregon-Washington
Corps of Engineers
In service July 17, 1968
2,160,000 KW
Space for four authorized units
would add 540,000 KW

PURPOSE

Power
Recreation
Navigation
Flood Control
Power Storage
Irrigation

4

McNary

Columbia River,
Oregon-Washington
Corps of Engineers
In service November 6, 1953
980,000 KW
Ten units under
consideration would
add 1,050,000 KW

PURPOSE

Power
Recreation
Navigation

5

Priest Rapids

Columbia River, Washington
Grant County P.U.D.
In service October 19, 1959
788,500 KW
Space for six units would add
473,100 KW

PURPOSE

Power
Recreation

6

Wanapum

Columbia River, Washington
Grant County P.U.D.
In service September 1, 1963
831,250 KW
Space for six units would add
498,750 KW

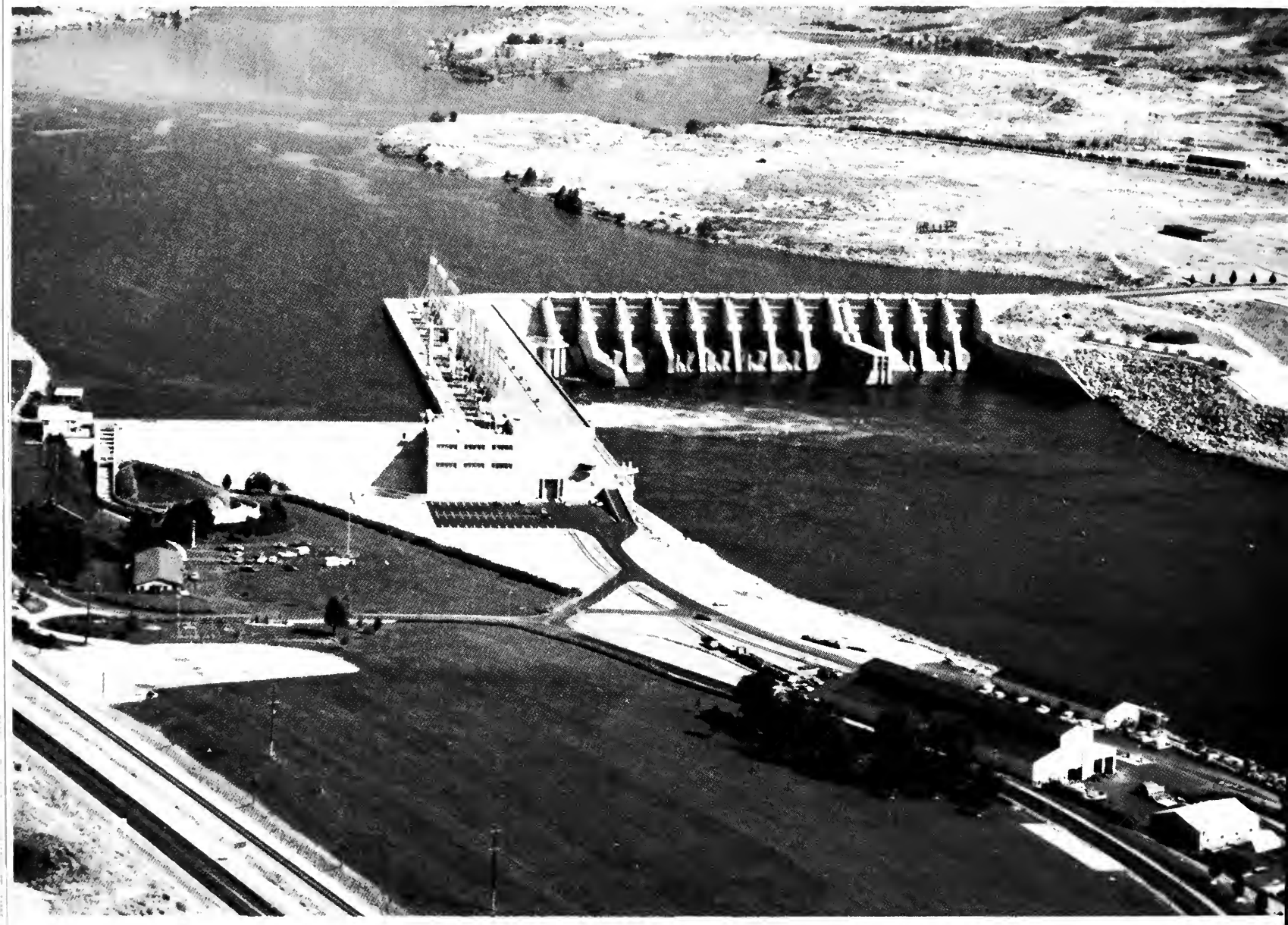
PURPOSE
Power
Navigation

7

Rock Island

Columbia River, Washington
Chelan County P.U.D.
In service 1933
212,100 KW
Eight generating units under
construction will add 410,400 KW

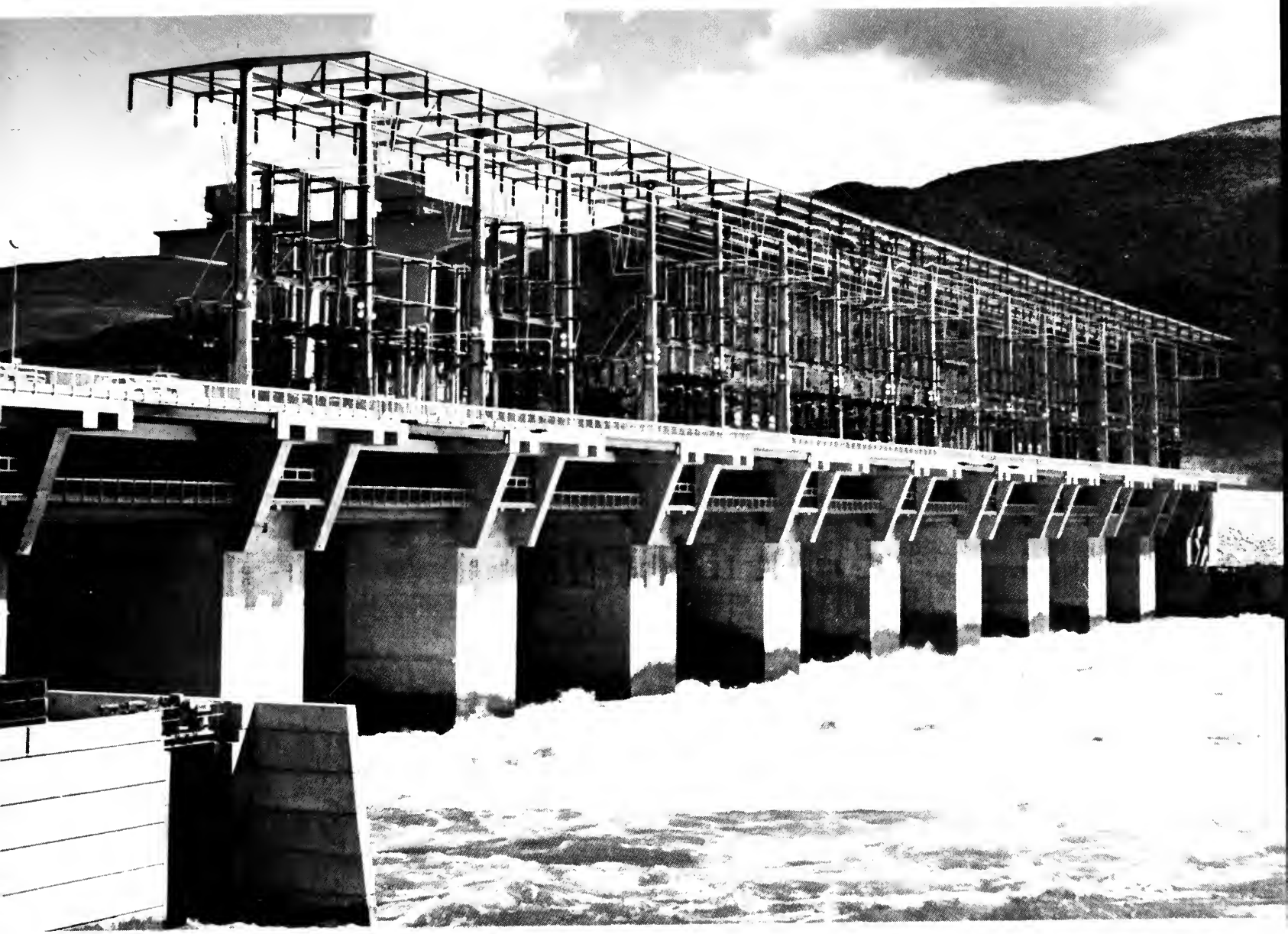
PURPOSE
Power



8 Rocky Reach

Columbia River, Washington
Chelan County P.U.D.
In service June 13, 1961
1,213,150 KW

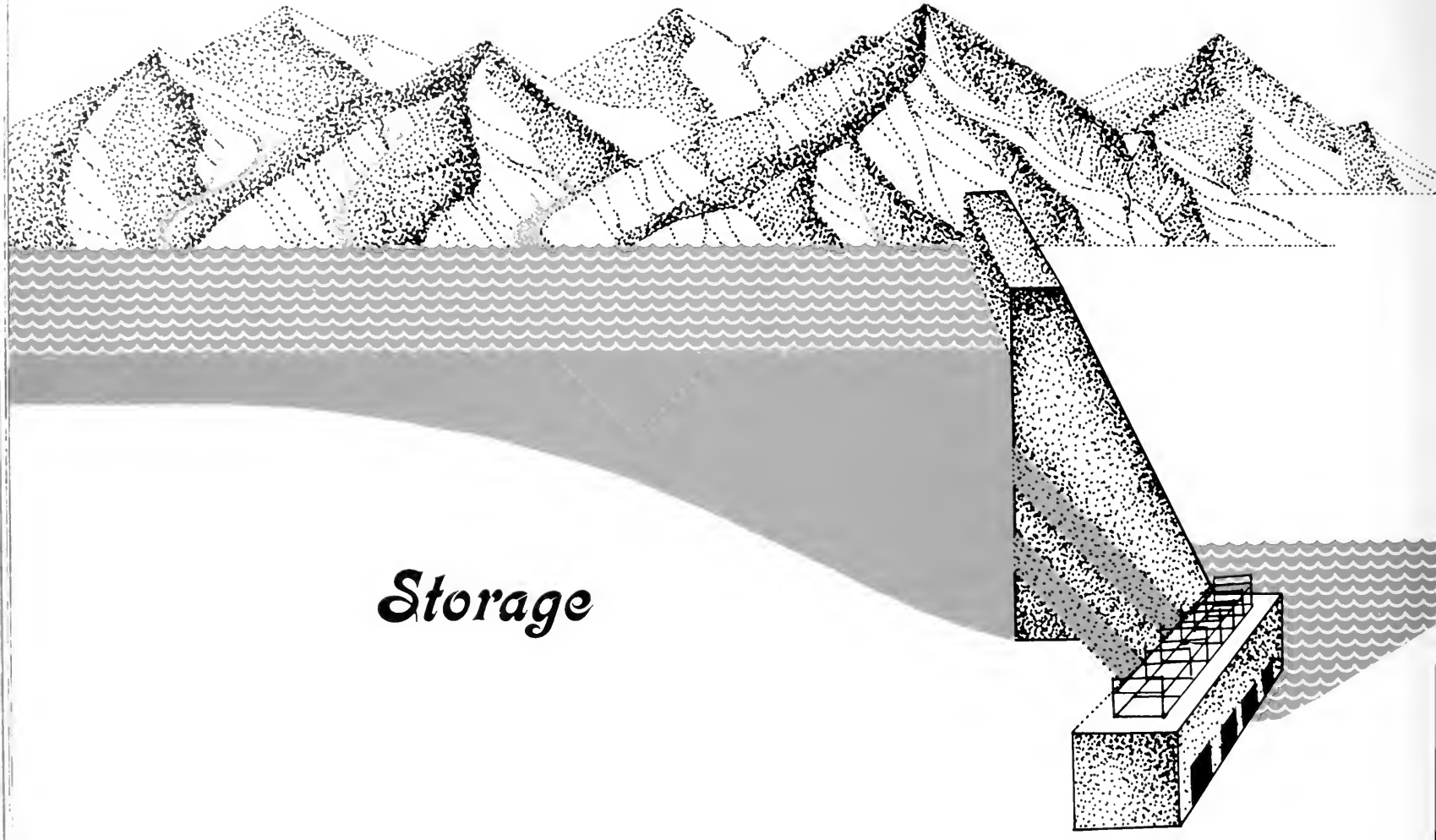
PURPOSE
Power
Recreation



9 Wells

Columbia River, Washington
Douglas County P.U.D.
In service September 1, 1967
774,300 KW

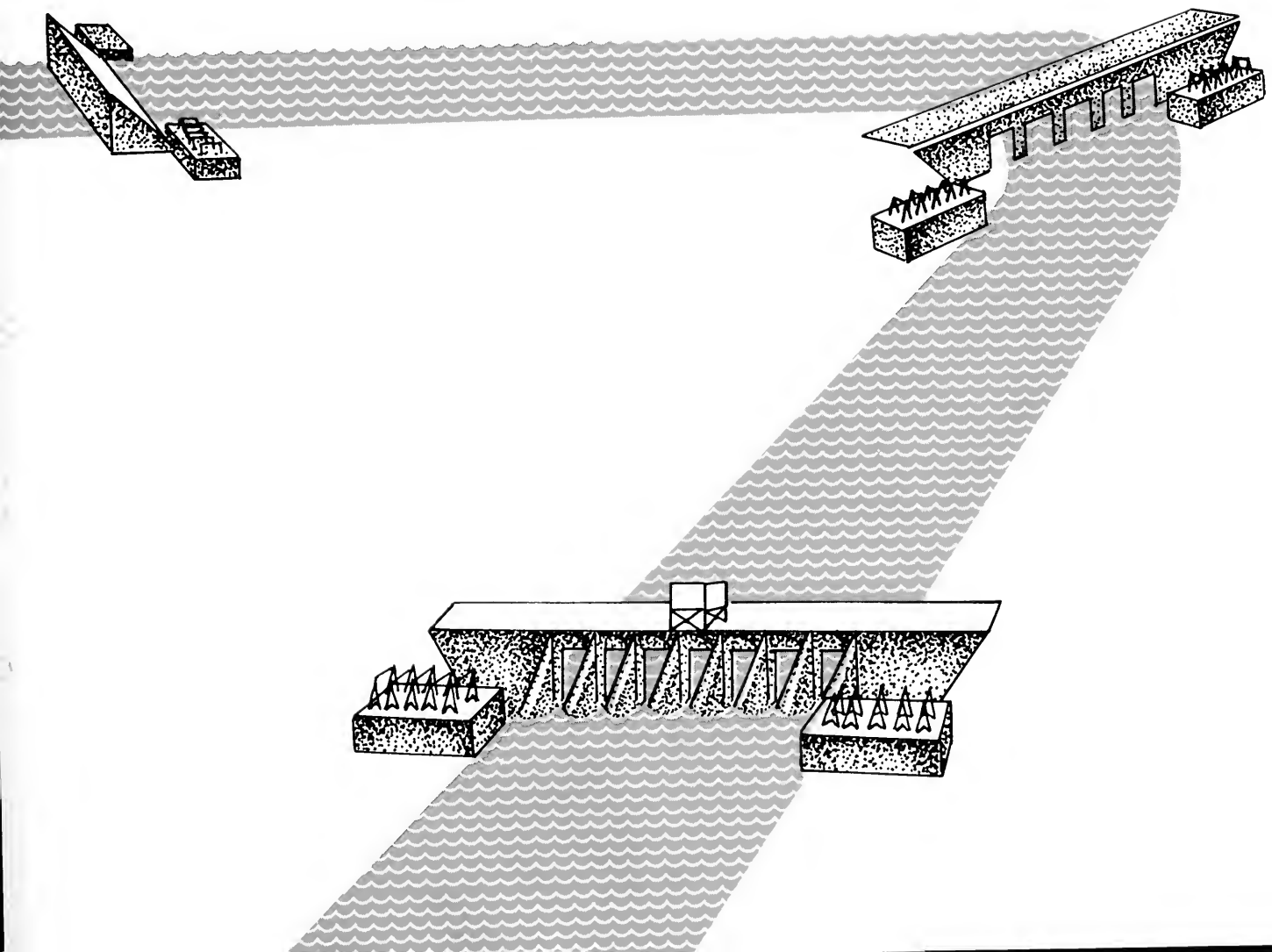
PURPOSE
Power

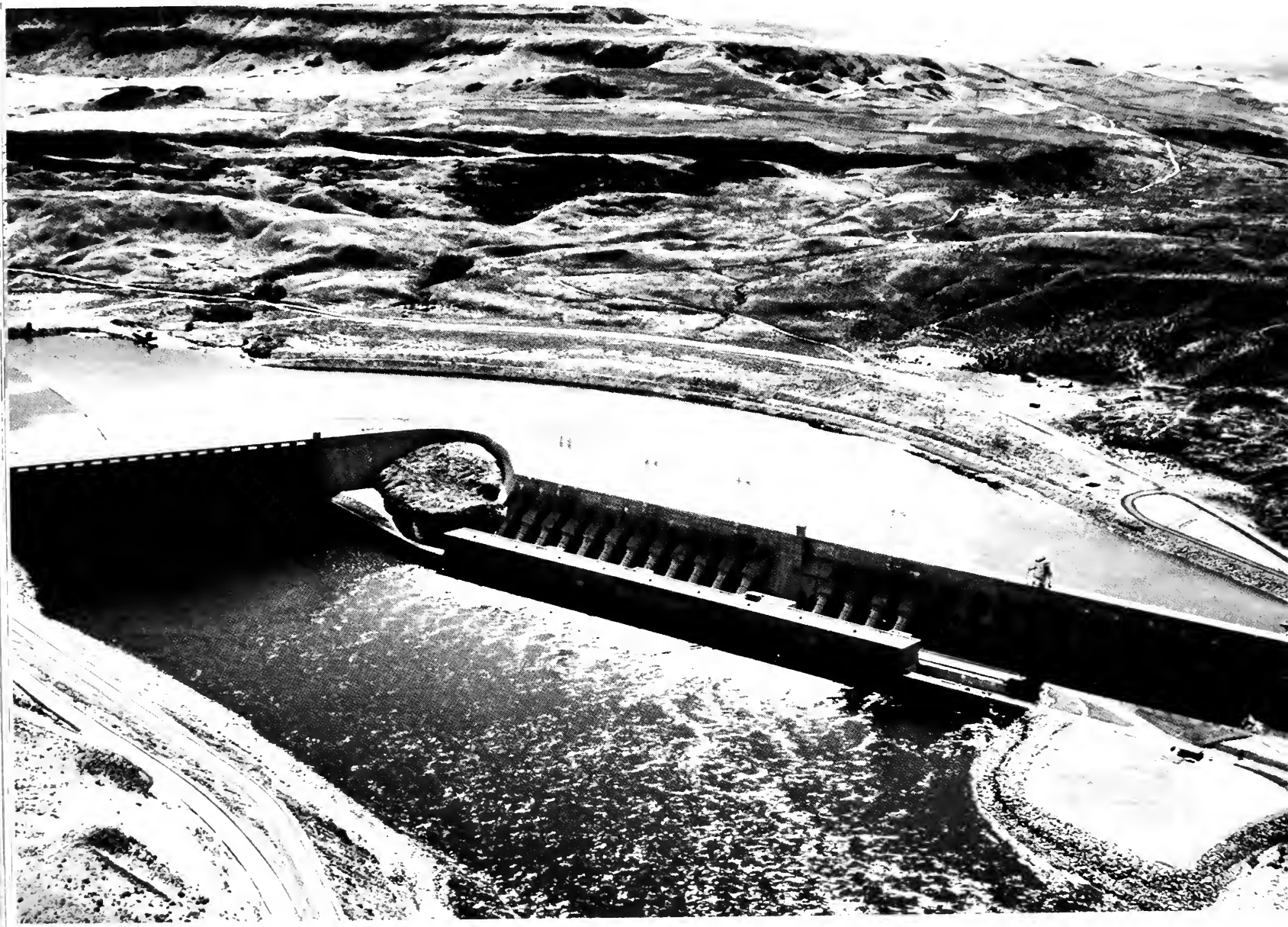


Storage

Upstream storage dams hold back the heavy spring and summer snowmelt runoffs. Then, in the fall and winter when streamflows would ordinarily be low, water is gradually released to sustain levels of power generation at site and downstream run-of-the river dams.

Run of River



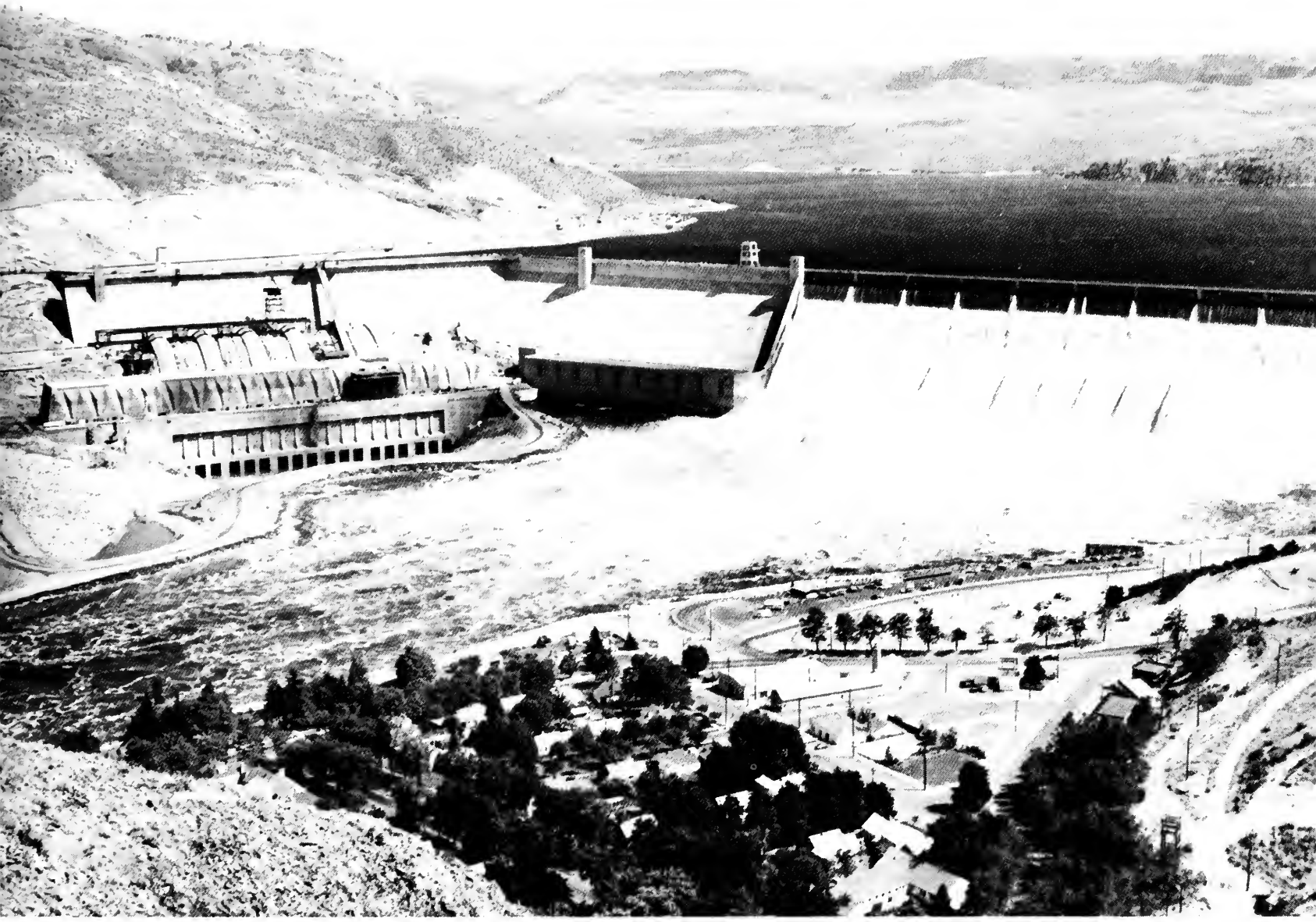


10 Chief Joseph

Columbia River, Washington
Corps of Engineers
In service August 20, 1955
1,404,000 KW
Seven generating units under
construction will add 665,000 KW

PURPOSE
Power
Recreation

20

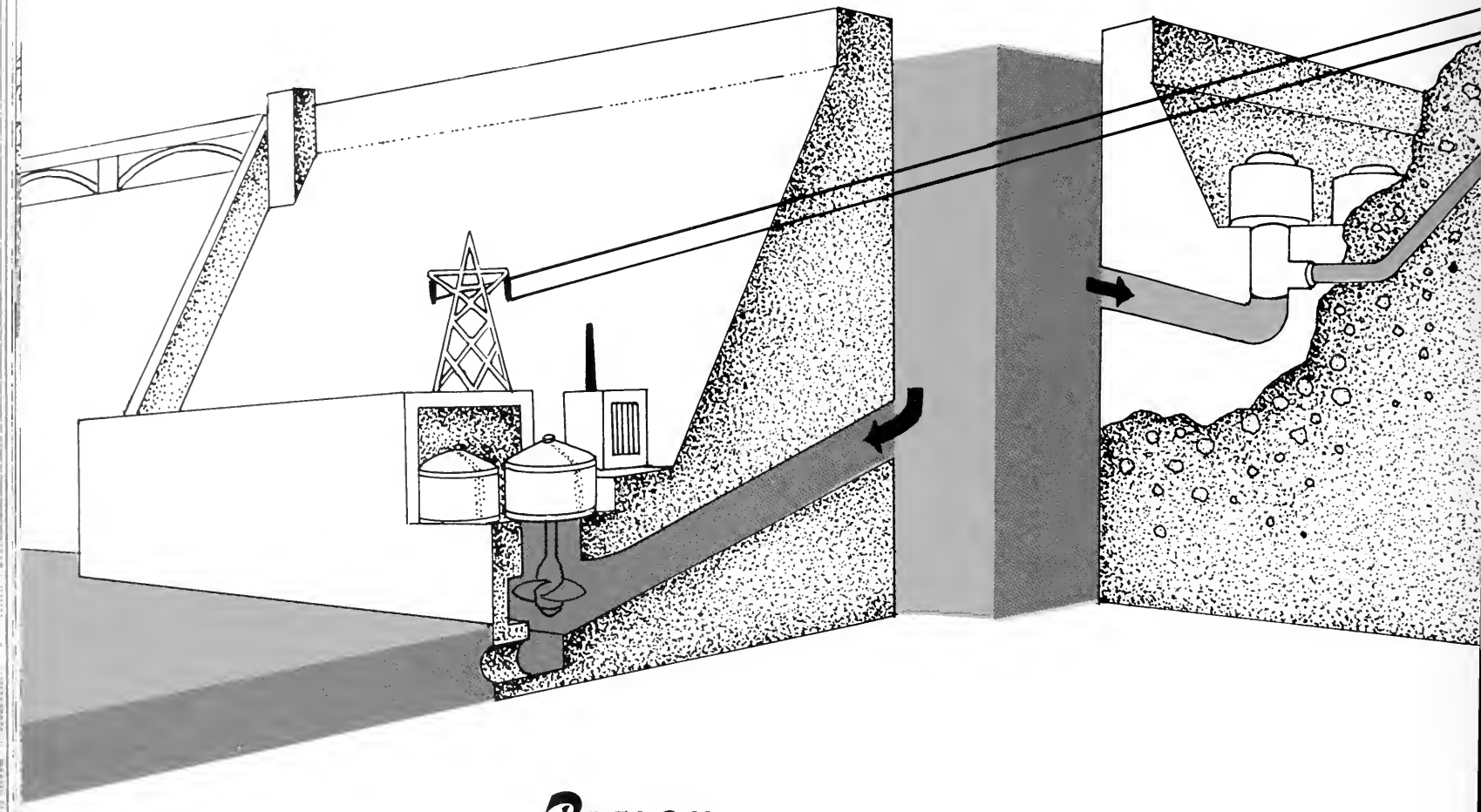


11 *Grand Coulee*

Columbia River, Washington
Bureau of Reclamation
In service September 28, 1941
4,063,000 KW
Three additional generating units at the third powerhouse (above left) will add 2,100,000 KW.

PURPOSE

Power
Navigation
Flood Control
Power Storage
Irrigation

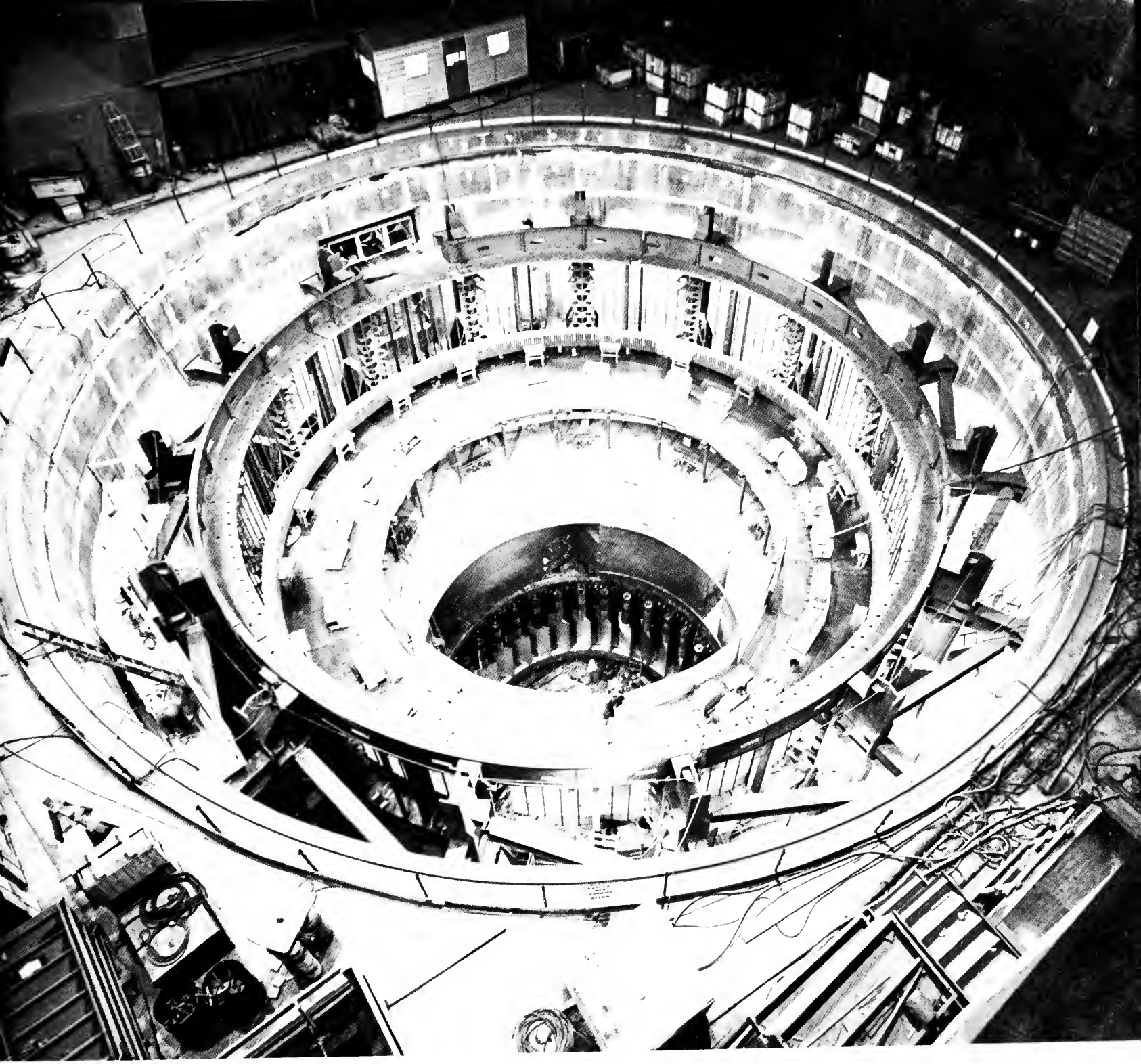


Power Generation

The workings of Grand Coulee Dam are shown in the simplified cutaway above. Water from the reservoir behind the dam flows through a huge pipe called a penstock, to turn the giant turbine that drives the generator that creates electricity.

Irrigation

Water for crops is pumped (at right) to irrigation projects.



Installation of gigantic new rotor in the Grand Coulee Dam third powerhouse.

Irrigation

Water is pumped out of reservoirs and directed to the Northwest's farmlands.

Flood Control

Disastrous 1948 floods accelerated the demand for multipurpose dams on the Columbia and its tributaries.

12 Keenleyside

Columbia River, British Columbia
British Columbia Hydro and
Power Authority
In service October 10, 1968
Storage — 7,100,000 acre-feet

PURPOSE
Flood Control
Power Storage

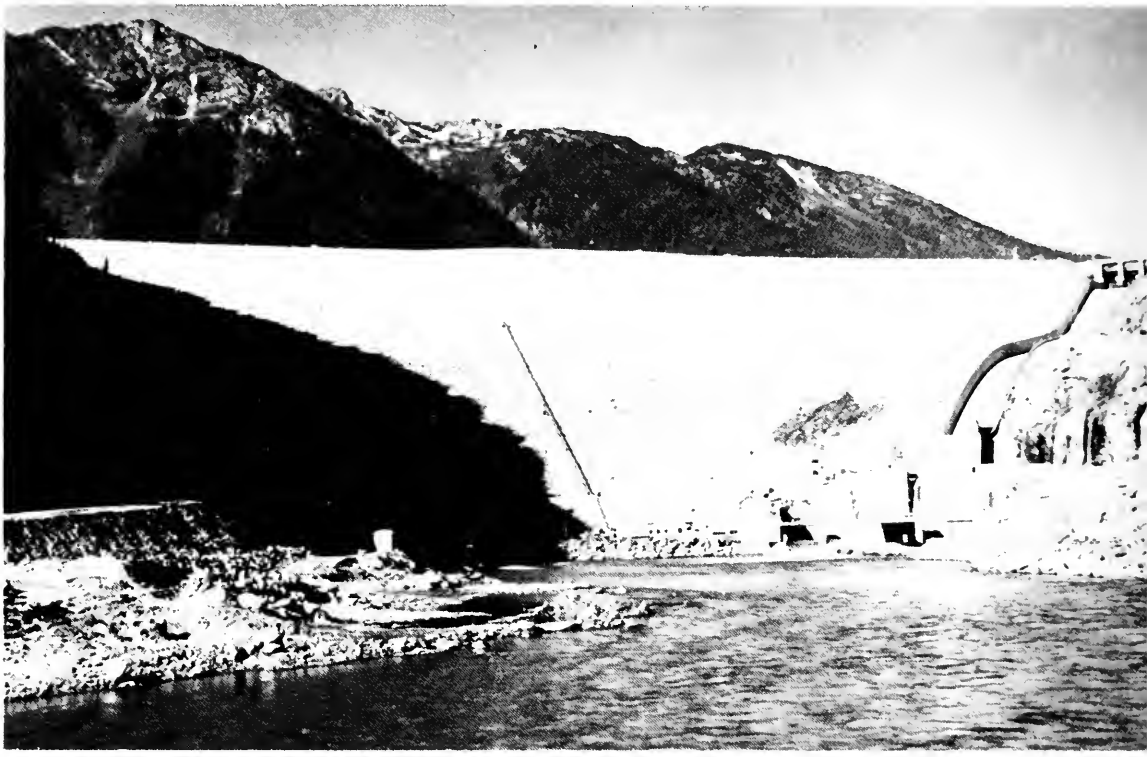
13

Mica

Columbia River, British Columbia
British Columbia Hydro and
Power Authority
In service March 29, 1973
Storage — 11,953,000 acre-feet
Generating units under
construction will provide
1,600,000 KW

PURPOSE

Power
Flood Control
Power Storage



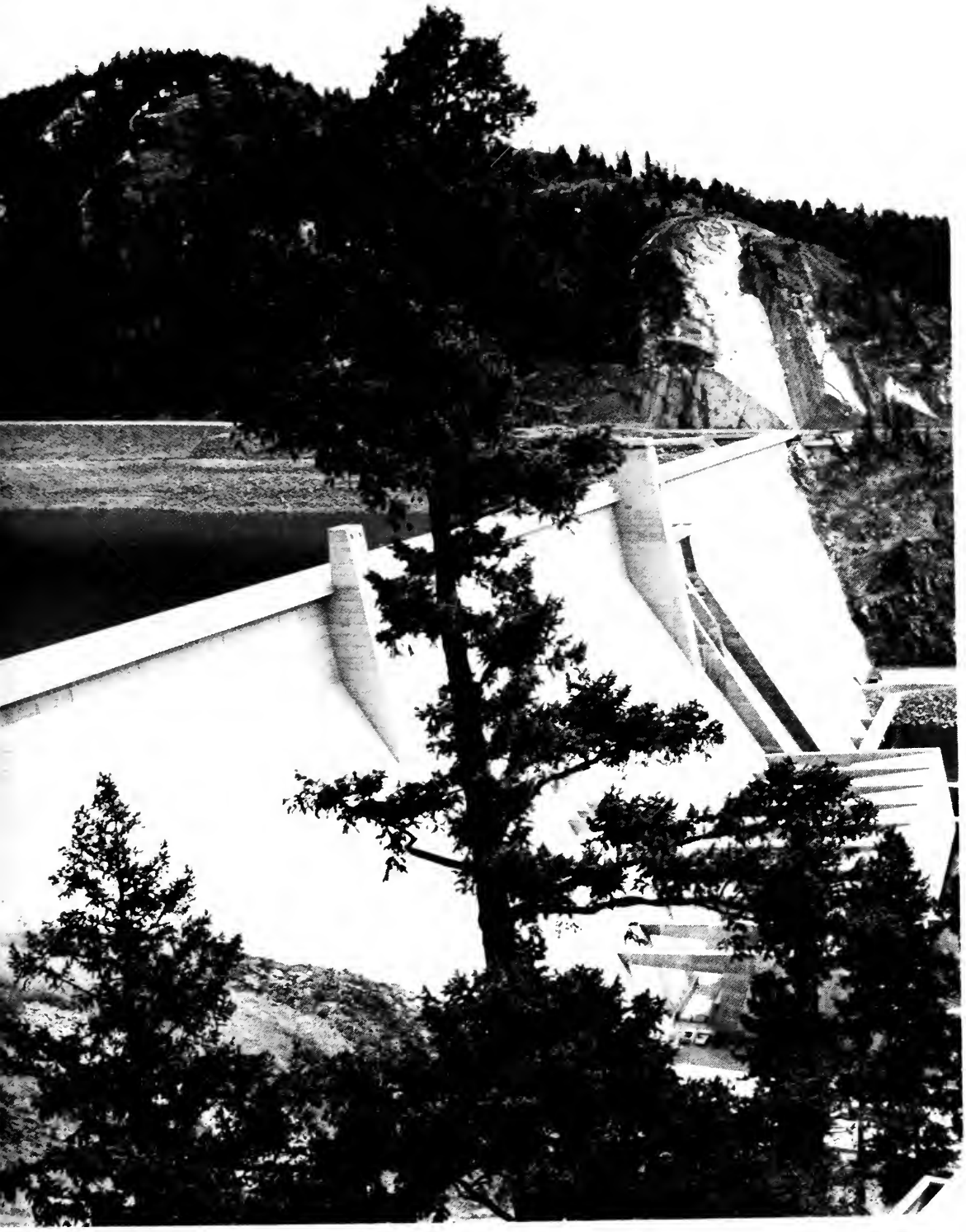
14

Duncan

Duncan River
British Columbia Hydro and
Power Authority
In service July 31, 1967
Storage — 1,400,000 acre-feet

PURPOSE

Flood Control
Power Storage



15
Libby

Kootenai River, Montana
Corps of Engineers
In service August 24, 1975
420,000 KW
Four units under
construction will add
420,000 KW

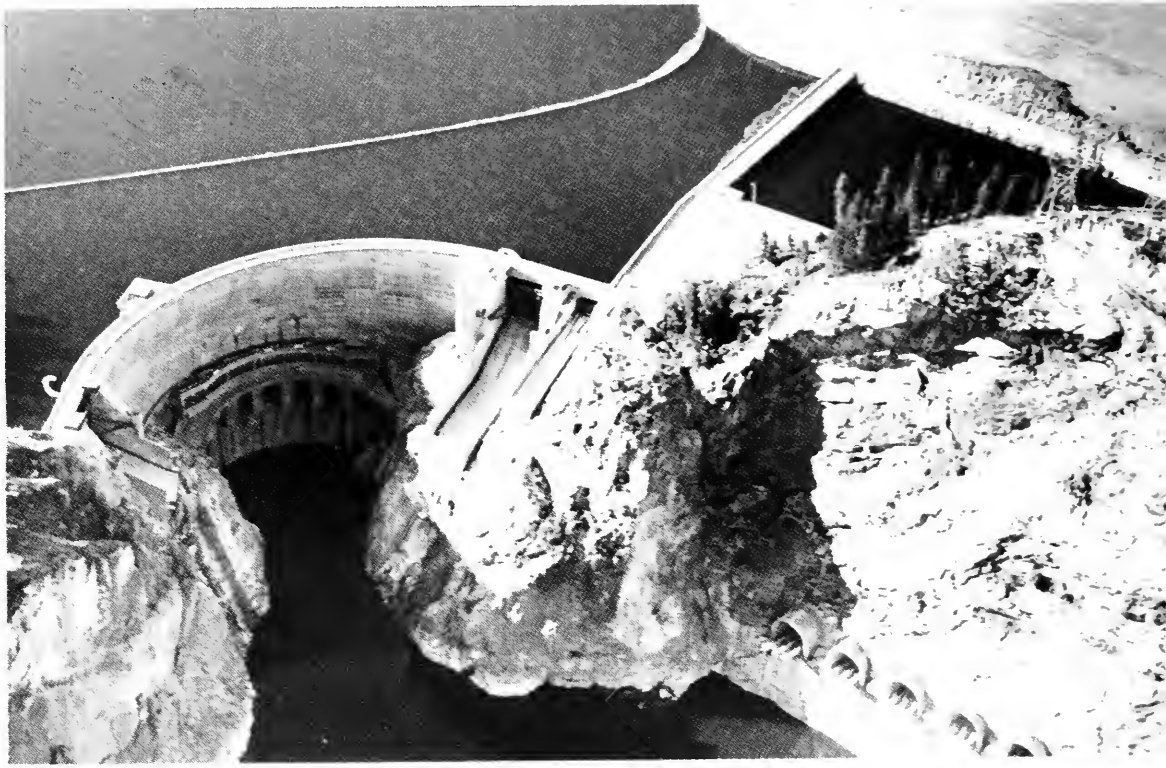
PURPOSE

Power
Recreation
Navigation
Flood Control
Power Storage

16
Boundary

Pend Oreille River, Washington
City of Seattle
In service September 1, 1967
551,000 KW

PURPOSE
Power
Recreation



17
Albeni Falls

Pend Oreille River, Idaho
Corps of Engineers
In service March 25, 1955
42,600 KW

PURPOSE
Power
Recreation
Navigation
Flood Control
Power Storage

18

Cabinet Gorge

Clark Fork, Idaho
Washington Water Power Co.
In service September 30, 1952
200,000 KW

PURPOSE
Power

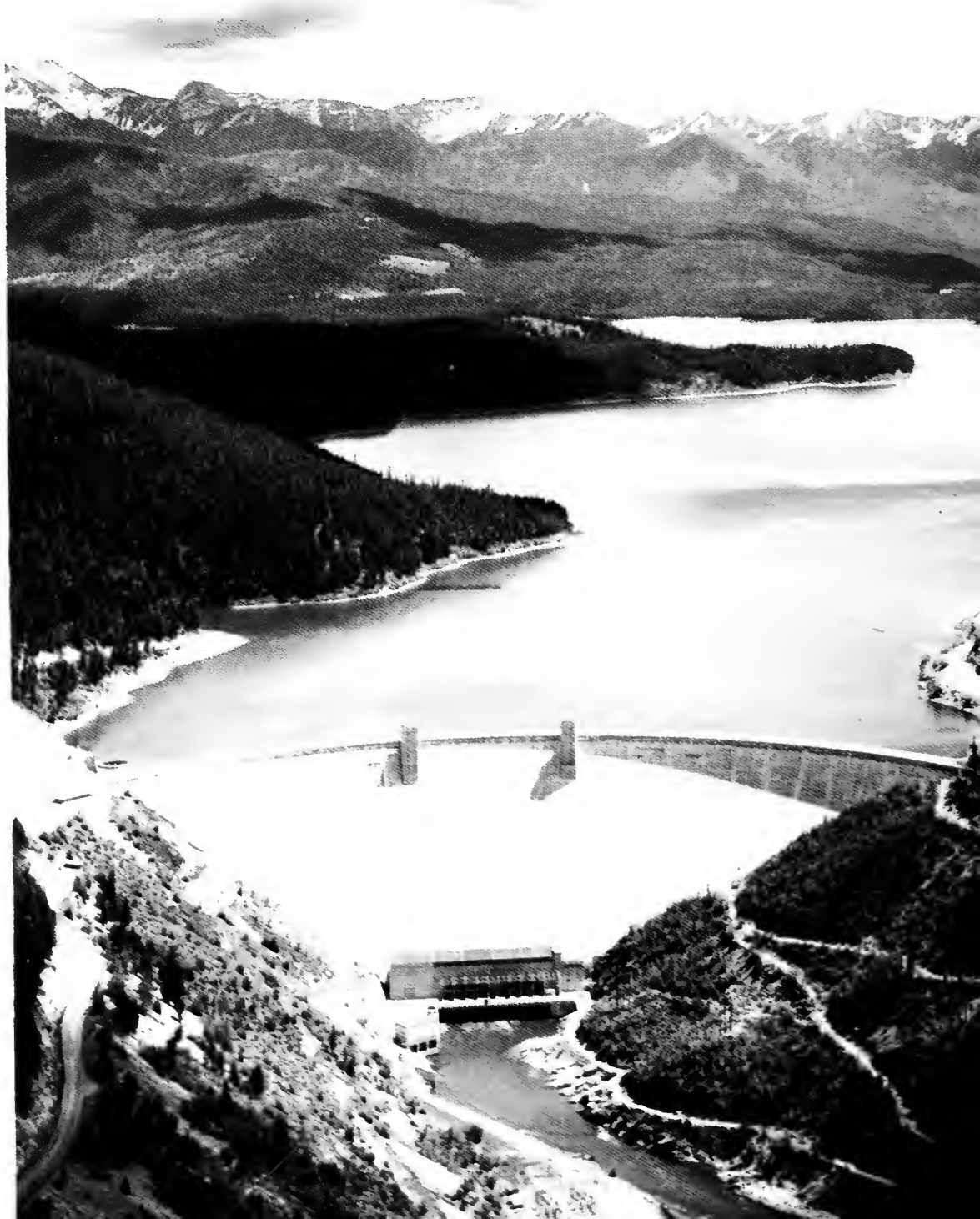
19 Noxon Rapids

Clark Fork, Montana
Washington Water Power Co.
In service September 1, 1959
282,880 KW

PURPOSE
Power
Power Storage

20 **Kerr**
Flathead River, Montana
Montana Power Co.
In service May 1939
168,000 KW

PURPOSE
Power
Power Storage



21

Hungry Horse

South Fork, Flathead River,
Montana
Bureau of Reclamation
In service October 29, 1952
285,000 KW

PURPOSE

Power
Navigation
Flood Control
Power Storage
Irrigation

22 Chandler

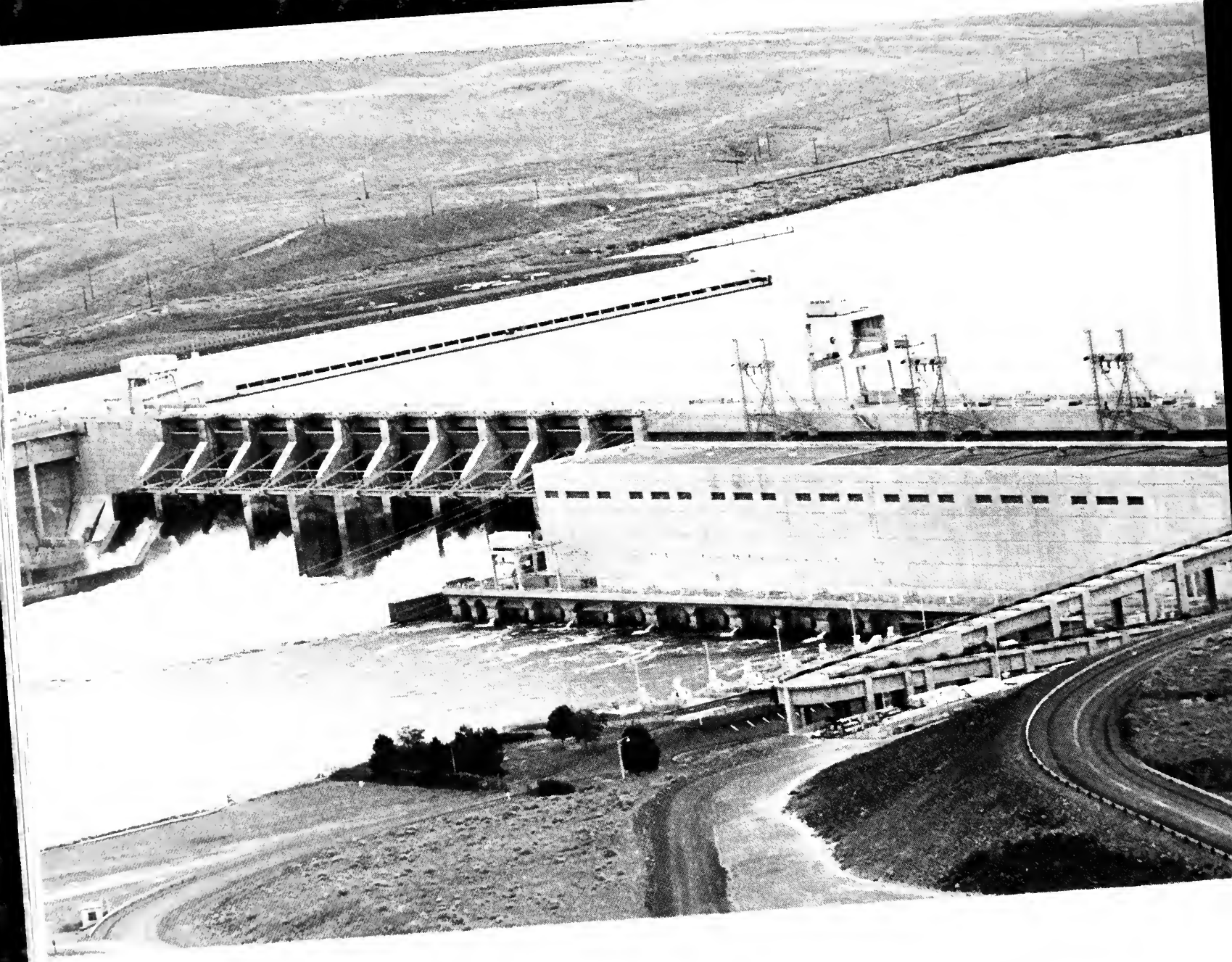
Yakima River, Washington
Bureau of Reclamation
In service February 13, 1956
12,000 KW

PURPOSE
Power

23 Roza

Yakima River, Washington
Bureau of Reclamation
In service August 31, 1958
11,250 KW

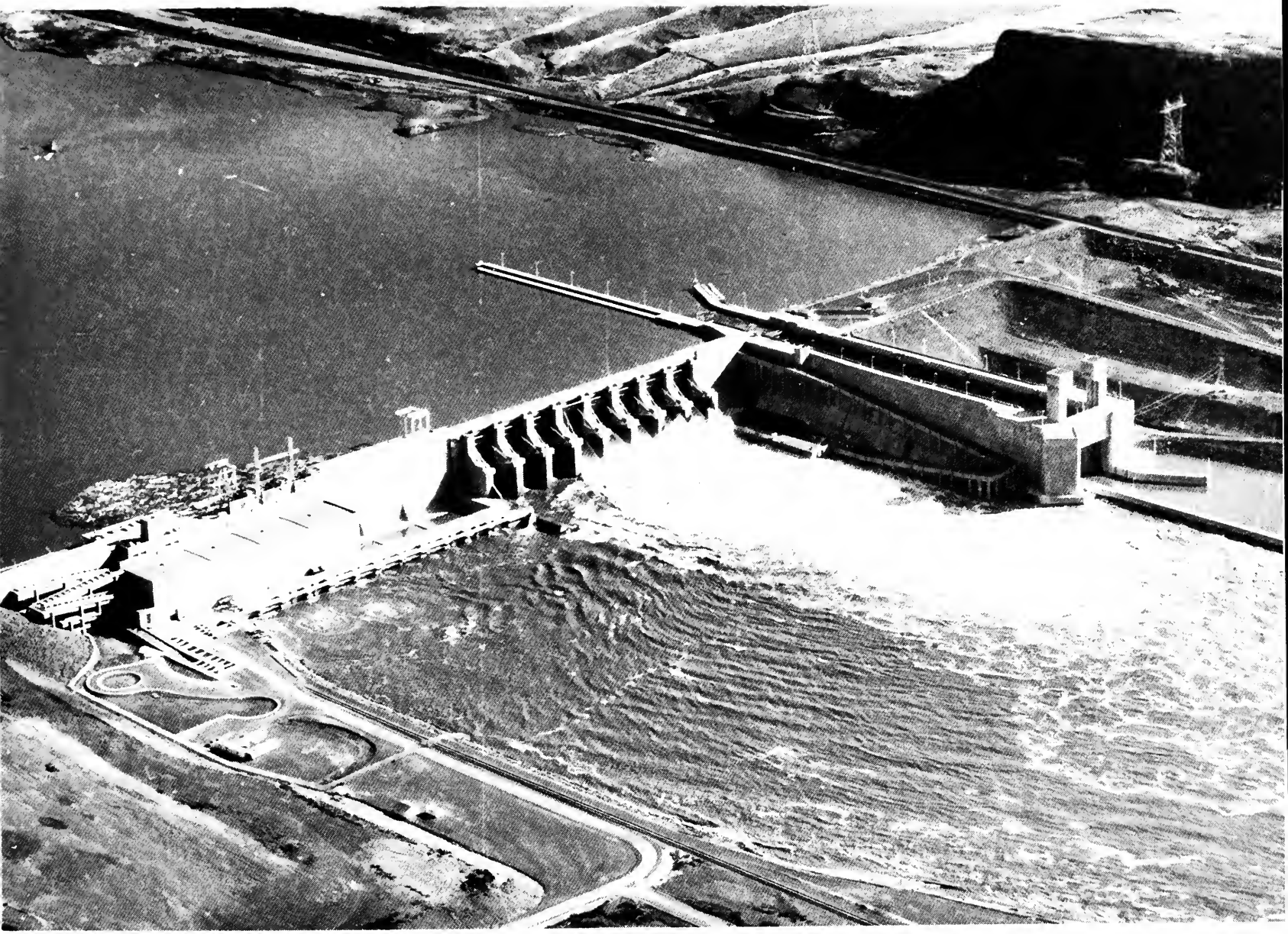
PURPOSE
Power
Irrigation



24 Ice Harbor

Snake River, Washington
Corps of Engineers
In service December 18, 1961
602,880 KW

PURPOSE
Power
Recreation
Navigation



25 *Lower Monumental*

Snake River, Washington
Corps of Engineers
In service May 28, 1968
405,000 KW
Three generating units under
construction will add 405,000 KW

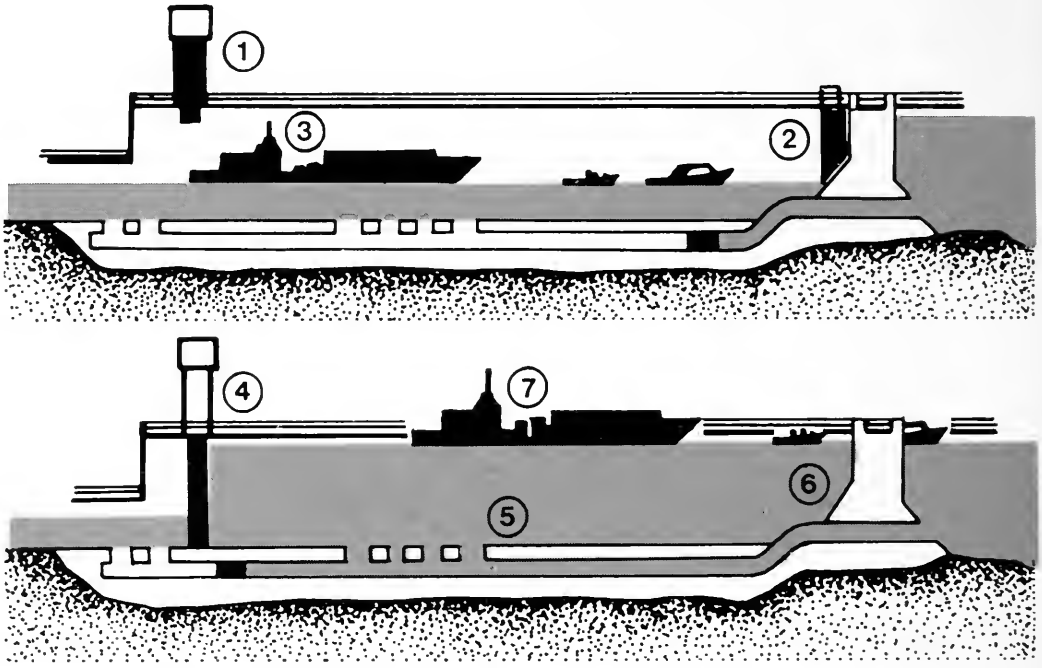
PURPOSE
Power
Recreation
Navigation
Irrigation

The Lock

How it Works

1. Downstream gate open
2. Upstream gate closed
3. Boats enter lock
4. Downstream gate closed
5. Lock filled to pool elevation
6. Upstream gate open
7. Boats leave lock

Downstream lockage
— reverse procedure



26 *Little Goose*

Snake River, Washington
Corps of Engineers
In service May 19, 1970
540,000 KW
Two generating units under
construction will add 270,000 KW

PURPOSE

Power
Recreation
Navigation

27
Lower Granite

Snake River, Washington
Corps of Engineers
In service April 15, 1975
540,000 KW
Two units under construction
will add 270,000 KW

PURPOSE

Power
Recreation
Navigation
Irrigation

28

Dworshak

North Fork, Clearwater River, Idaho
Corps of Engineers
In service September 18, 1974
400,000 KW

PURPOSE

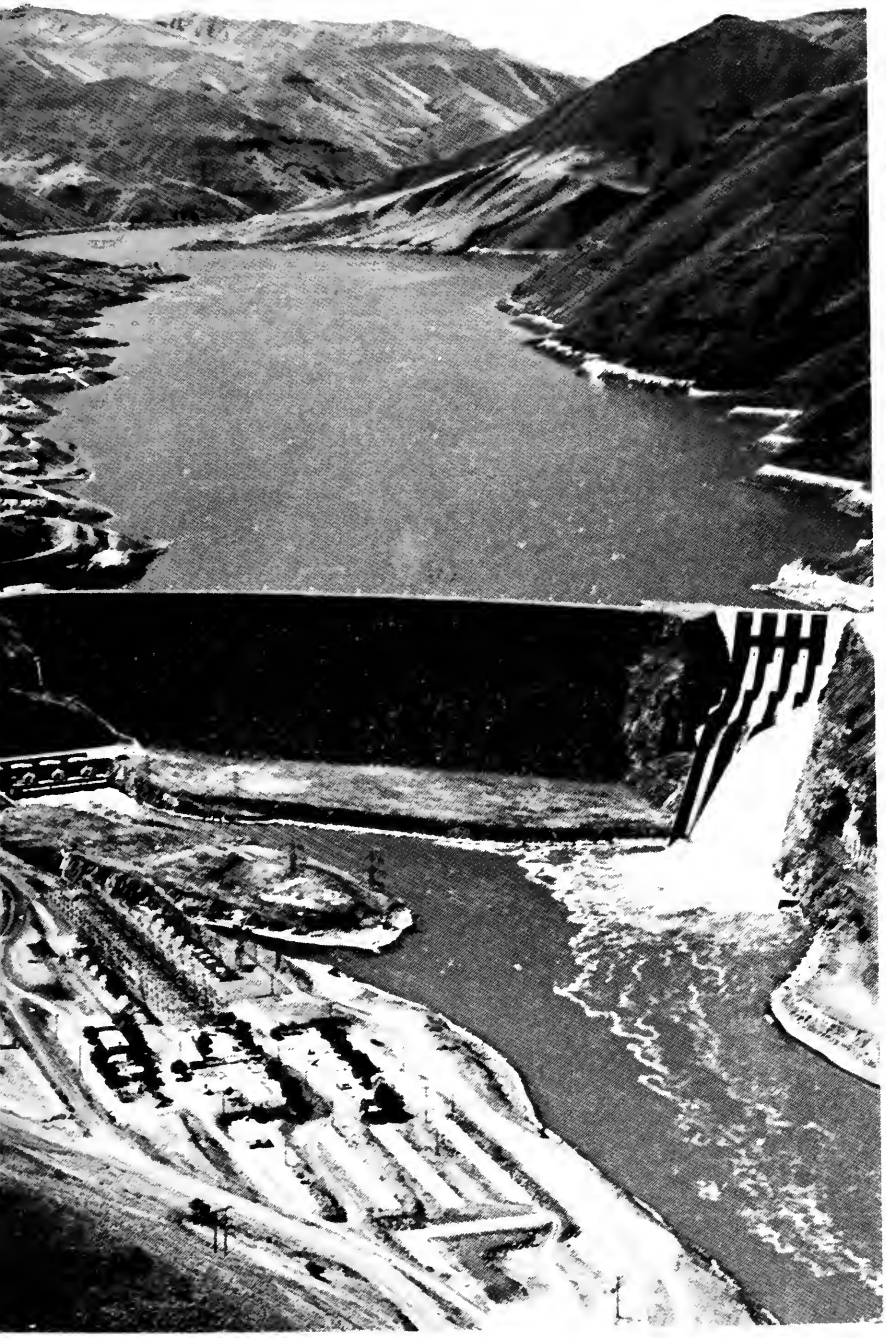
Power
Recreation
Navigation
Flood Control
Power Storage

29 Hells Canyon

Snake River, Idaho-Oregon
Idaho Power Co.
In service October 23, 1967
391,500 KW

PURPOSE
Power

40



30 Oxbow

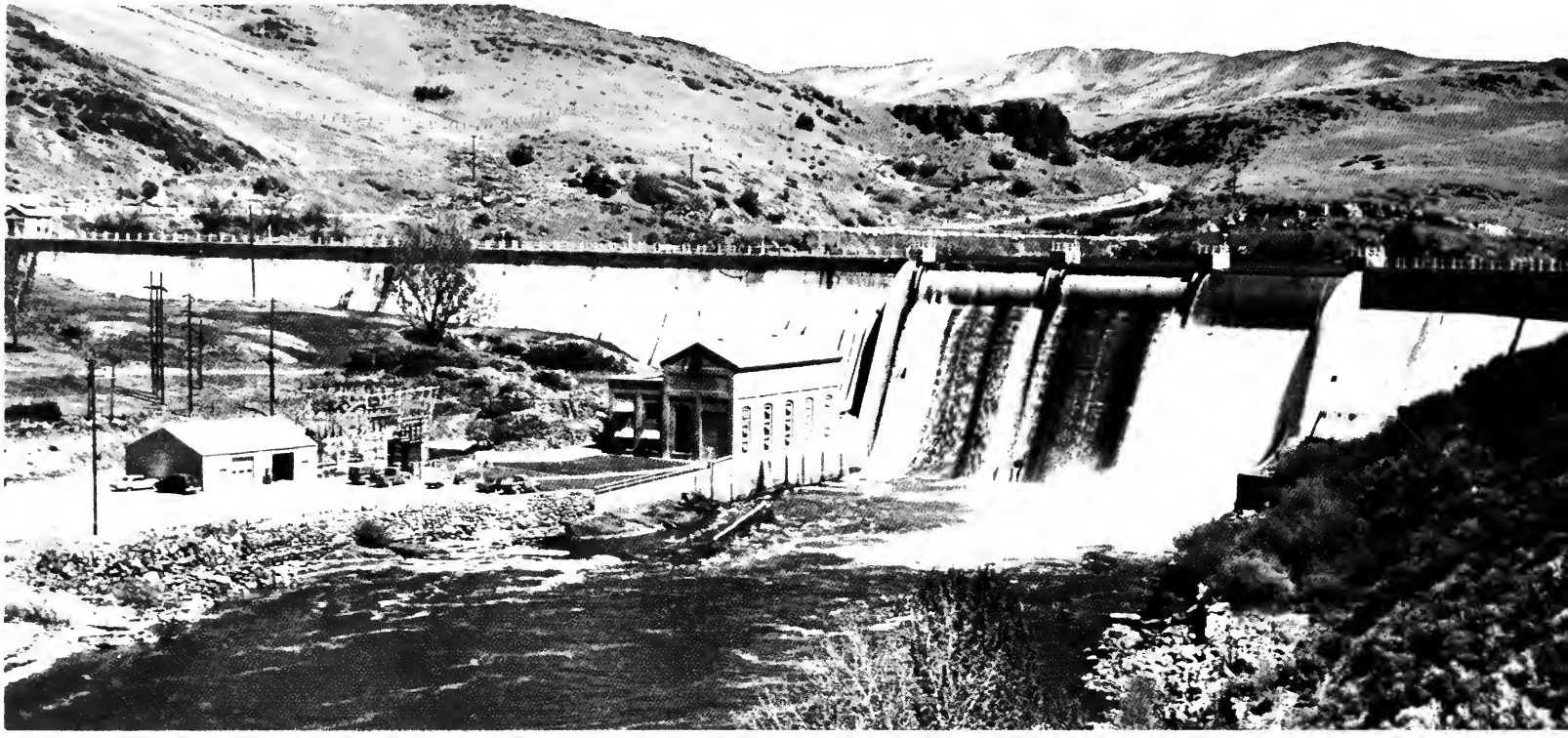
Snake River, Oregon-Idaho
Idaho Power Co.
In service July 5, 1961
190,000 KW

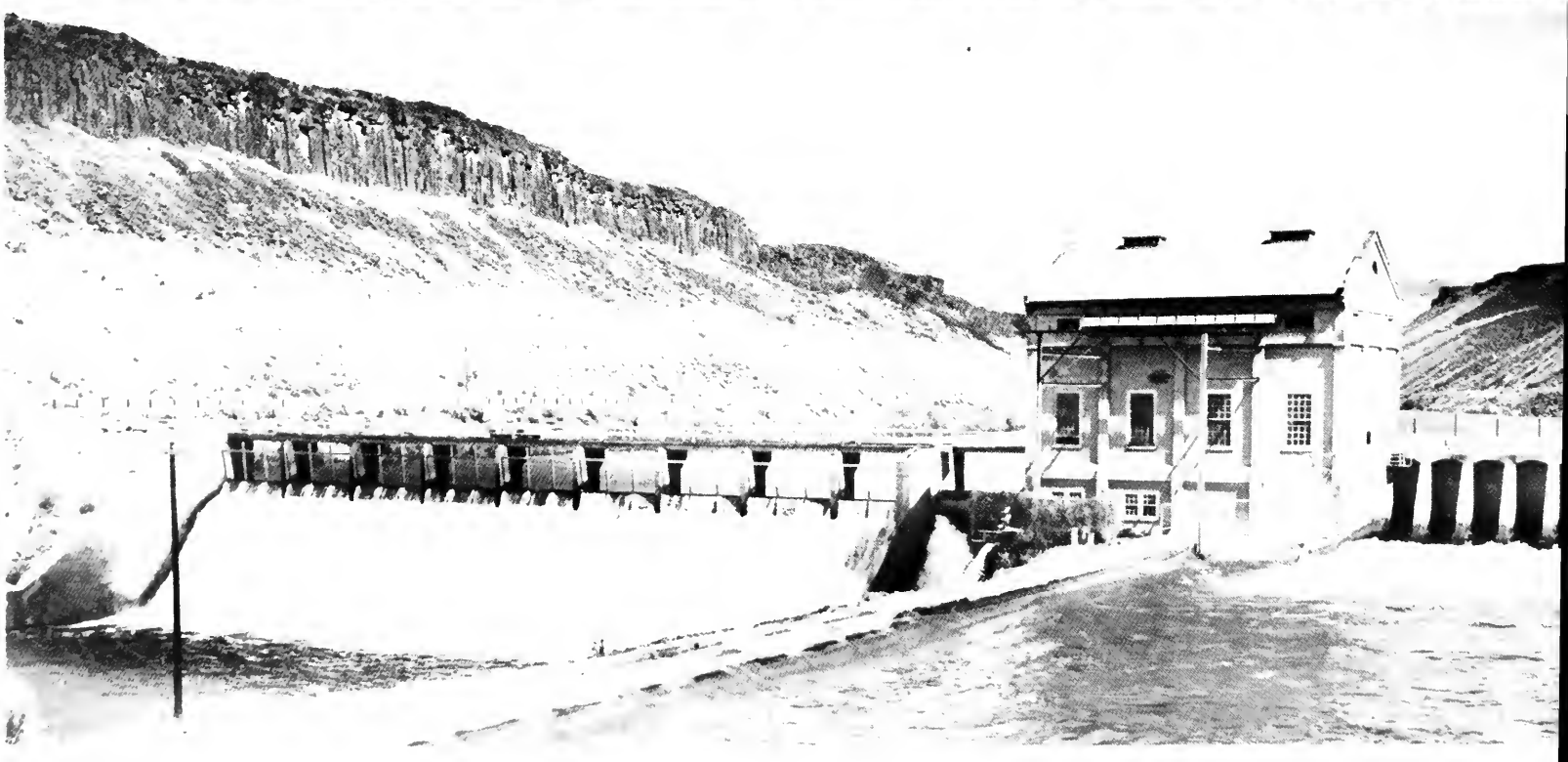
PURPOSE
Power

31 Brownlee

Snake River, Idaho-Oregon
Idaho Power Co.
In service August 27, 1958
360,400 KW

PURPOSE
Power
Flood Control
Power Storage





32

Black Canyon

Payette River, Idaho
Bureau of Reclamation
In service December 1925
8,000 KW

PURPOSE
Power
Flood Control
Irrigation

33

Boise Diversion

Boise River, Idaho
Bureau of Reclamation
In service May 1912
1,500 KW

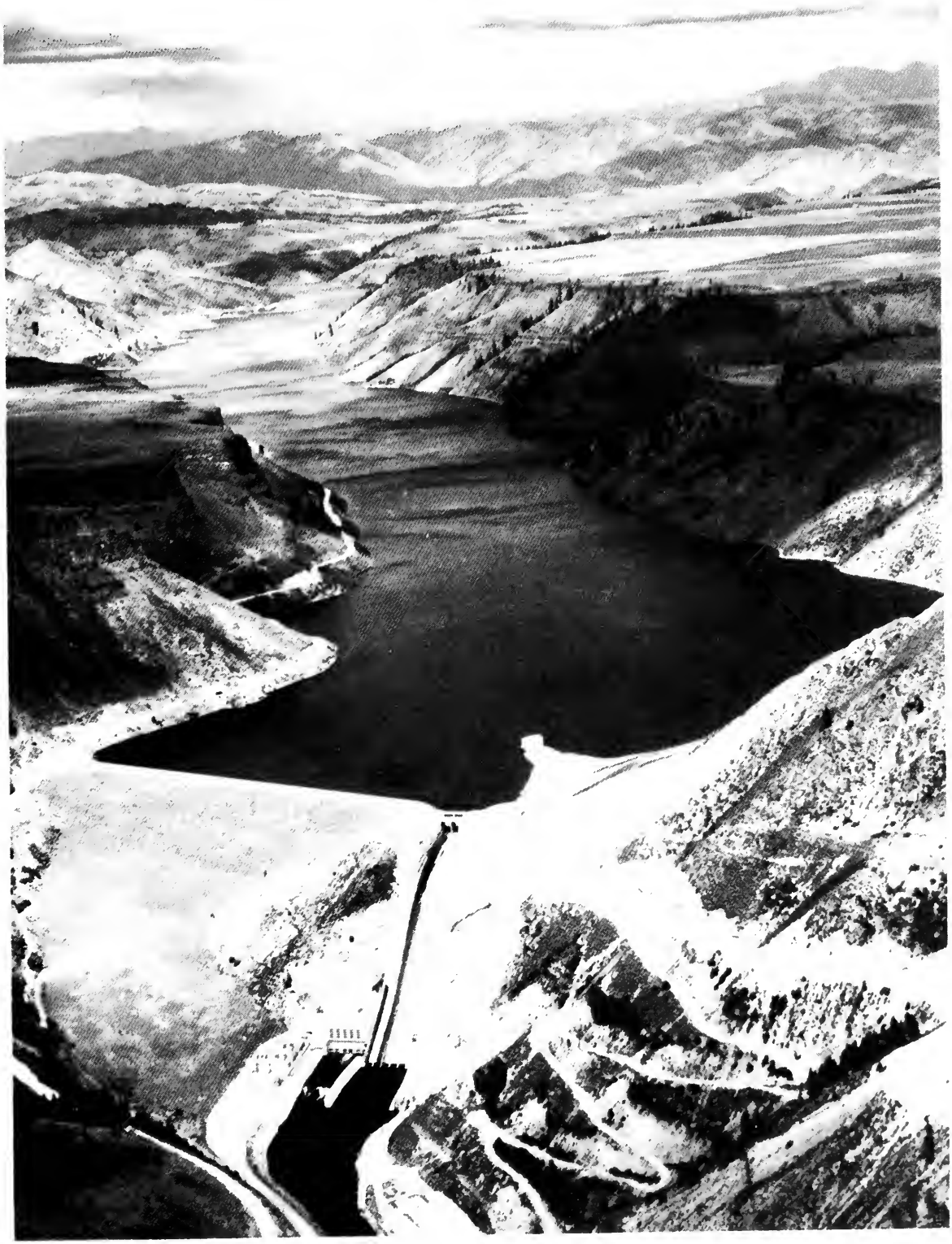
PURPOSE
Power
Irrigation

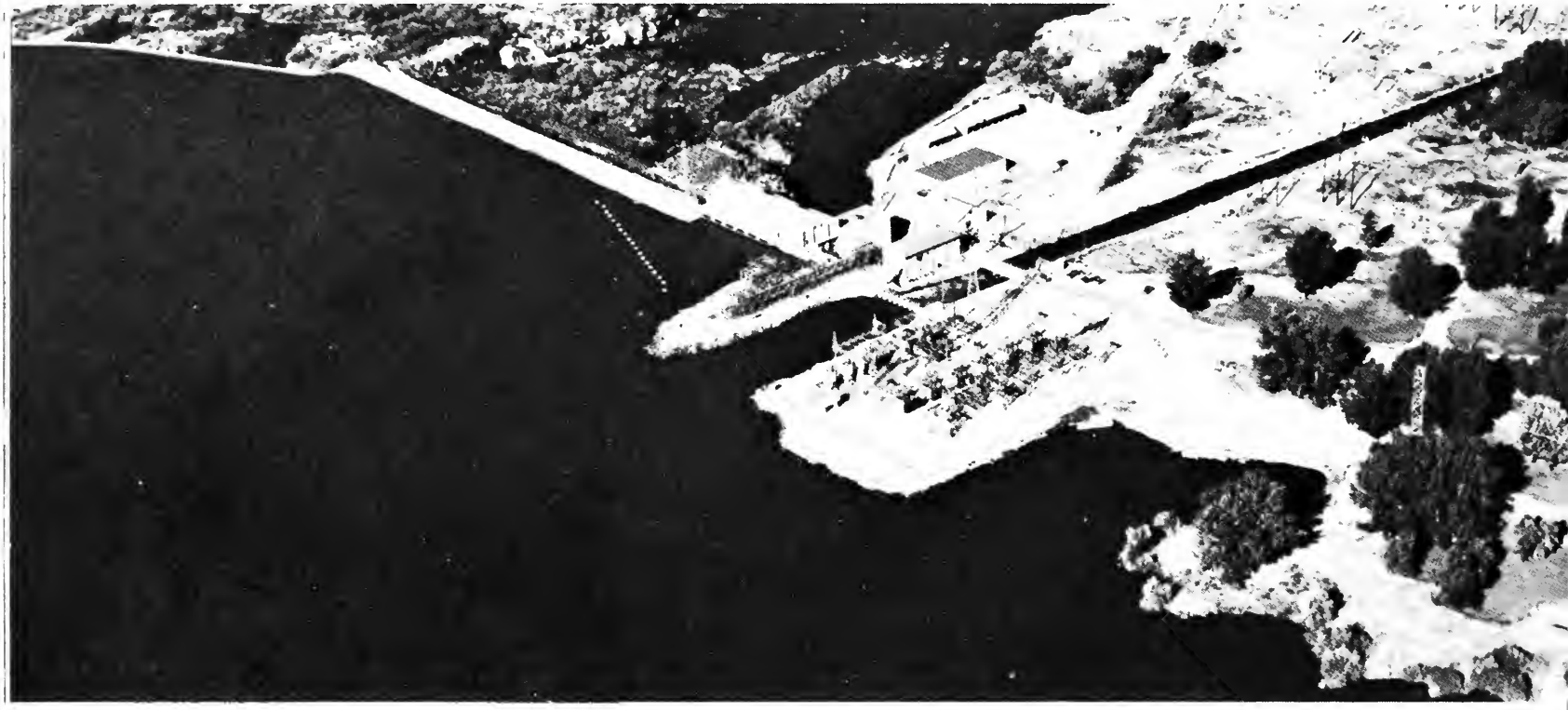
34

Anderson Ranch

South Fork, Boise River, Idaho
Bureau of Reclamation
In service December 15, 1950
27,000 KW

PURPOSE
Power
Flood Control
Power Storage
Irrigation





35 Minidoka

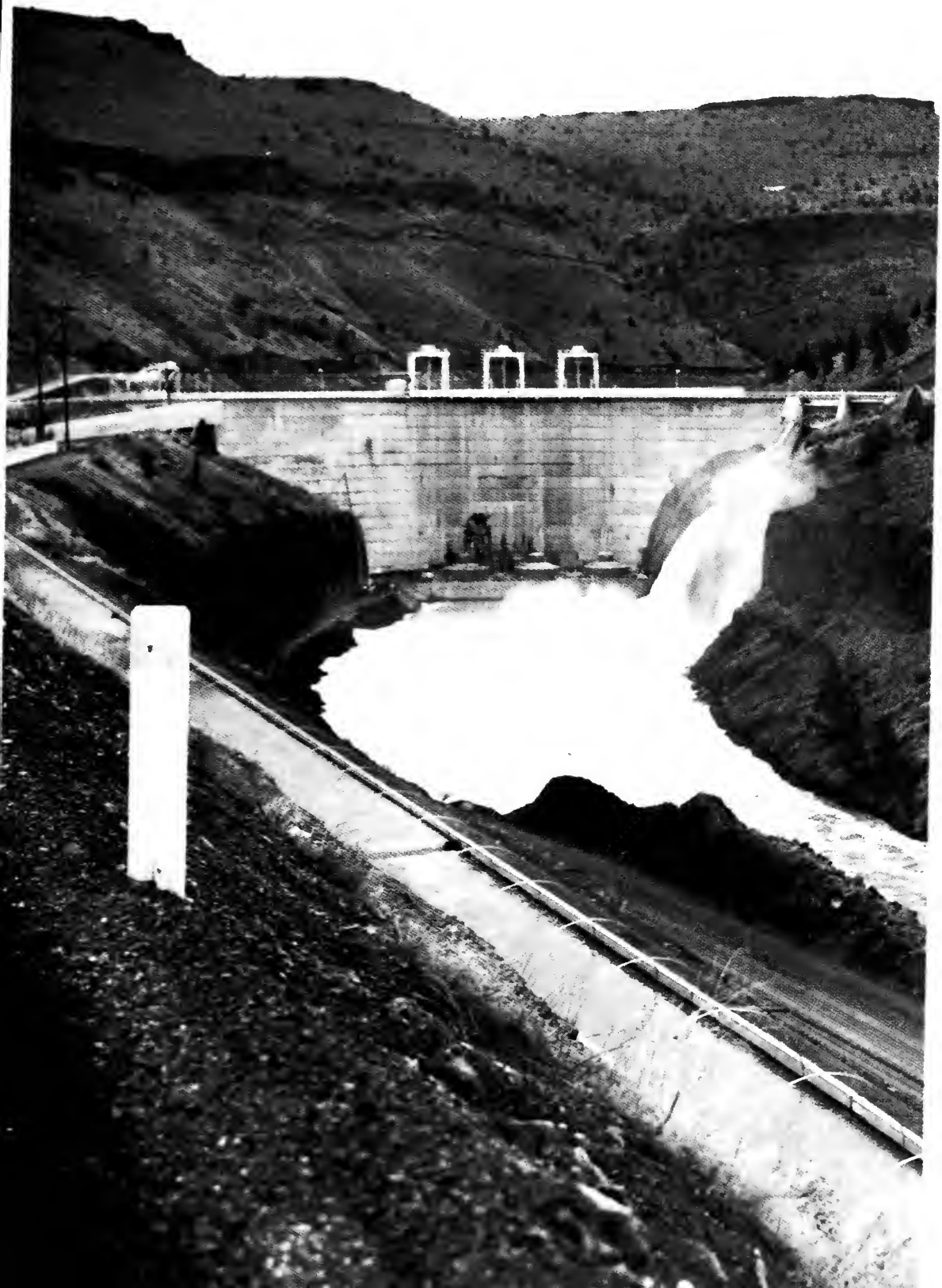
Snake River, Idaho
Bureau of Reclamation
In service May 7, 1909
13,400 KW

PURPOSE
Power
Power Storage
Irrigation

36 Palisades

Snake River, Idaho
Bureau of Reclamation
In service February 25, 1957
118,750 KW

PURPOSE
Power
Flood Control
Power Storage
Irrigation



37 Pelton

Deschutes River, Oregon
Portland General Electric Co.
In service December 20, 1957
108,000 KW

PURPOSE
Power

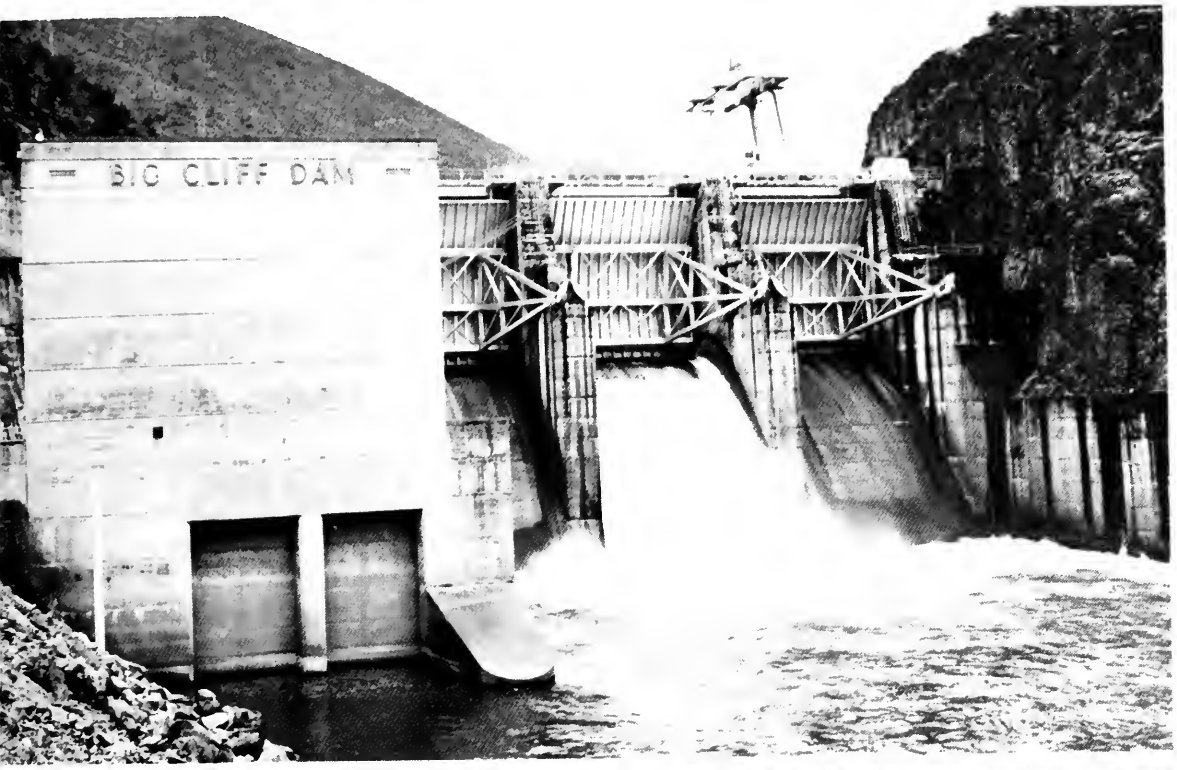
38

Round Butte

Deschutes River, Oregon
Portland General Electric Co.
In service August 7, 1964
247,050 KW

PURPOSE

Power
Power Storage



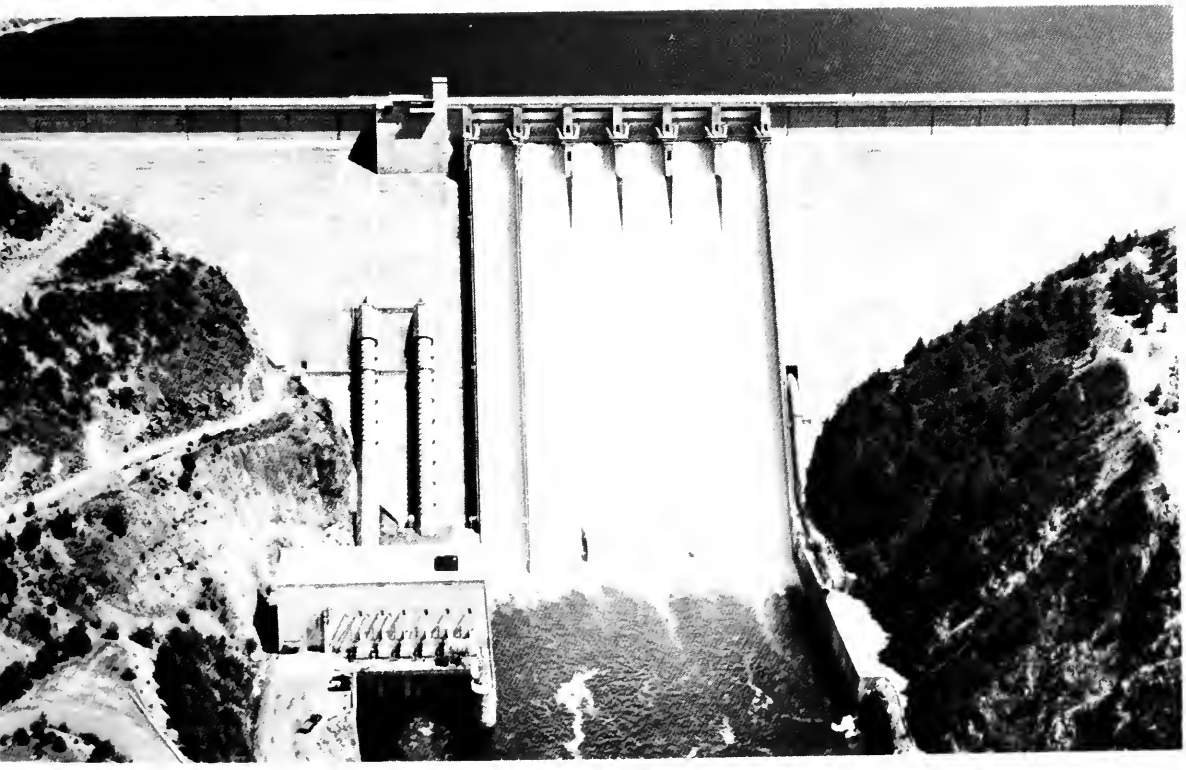
39

Big Cliff

North Santiam River, Oregon
Corps of Engineers
In service June 12, 1954
18,000 KW

PURPOSE

Power
Re-regulation for
Detroit Dam



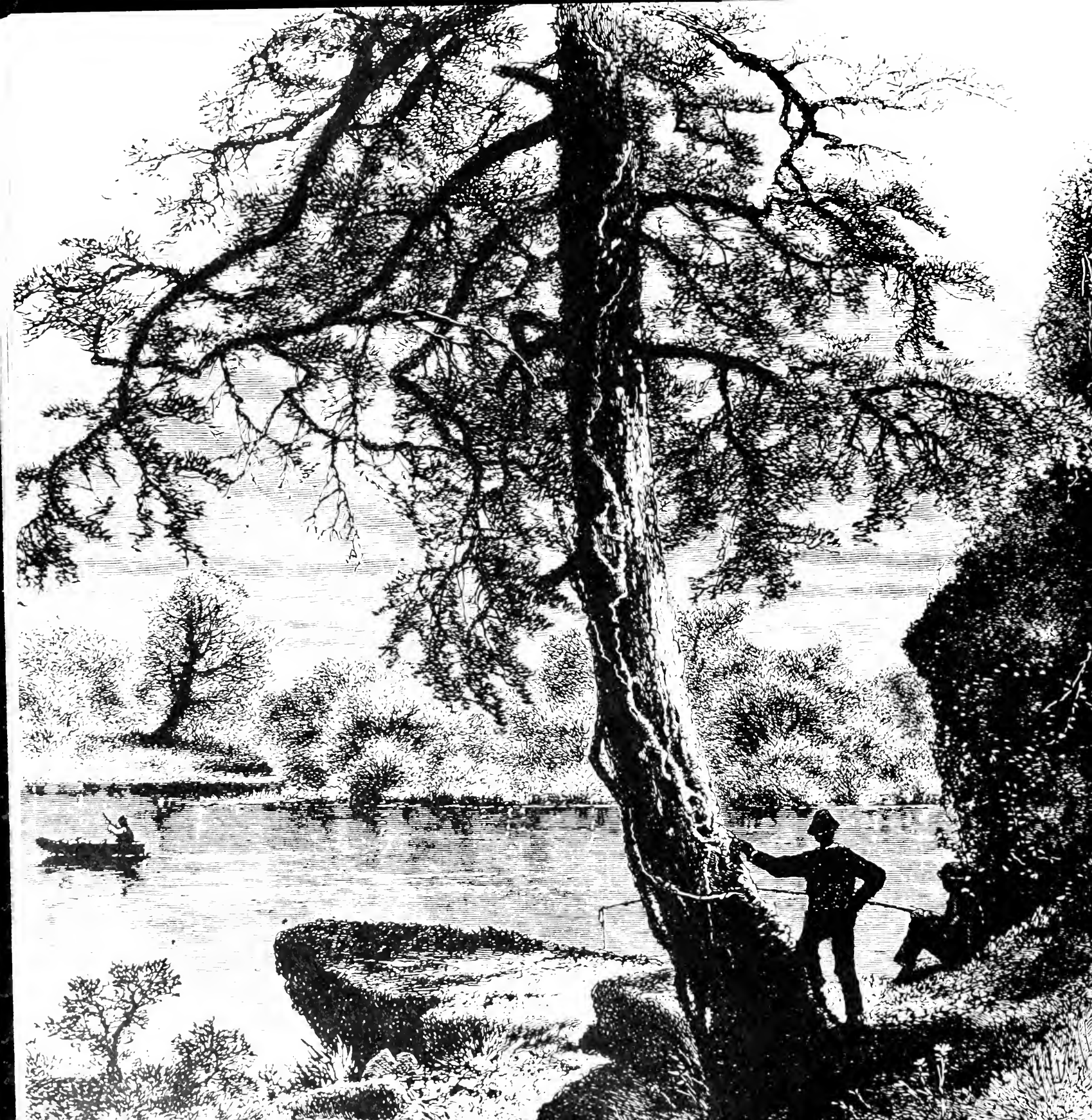
40

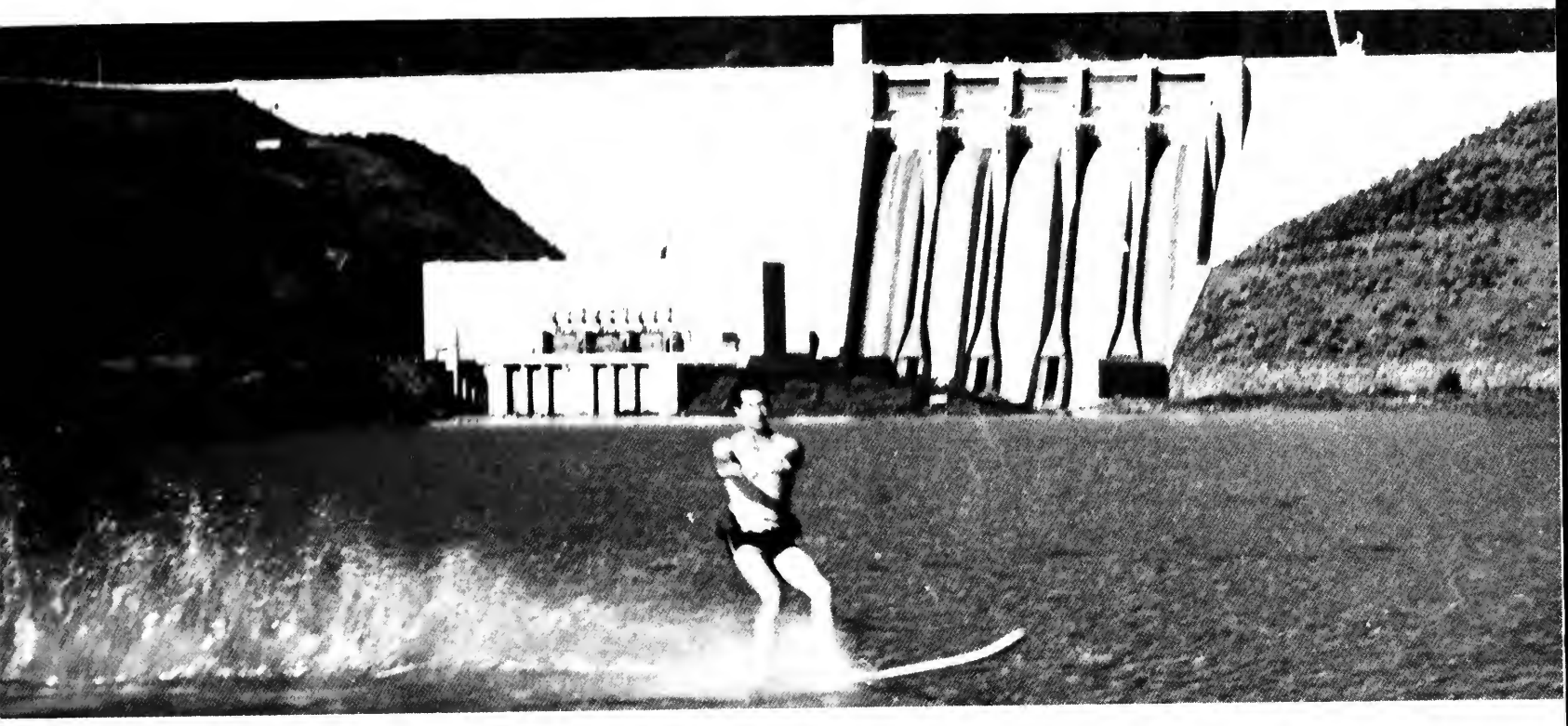
Detroit

North Santiam River, Oregon
Corps of Engineers
In service July 1, 1953
100,000 KW

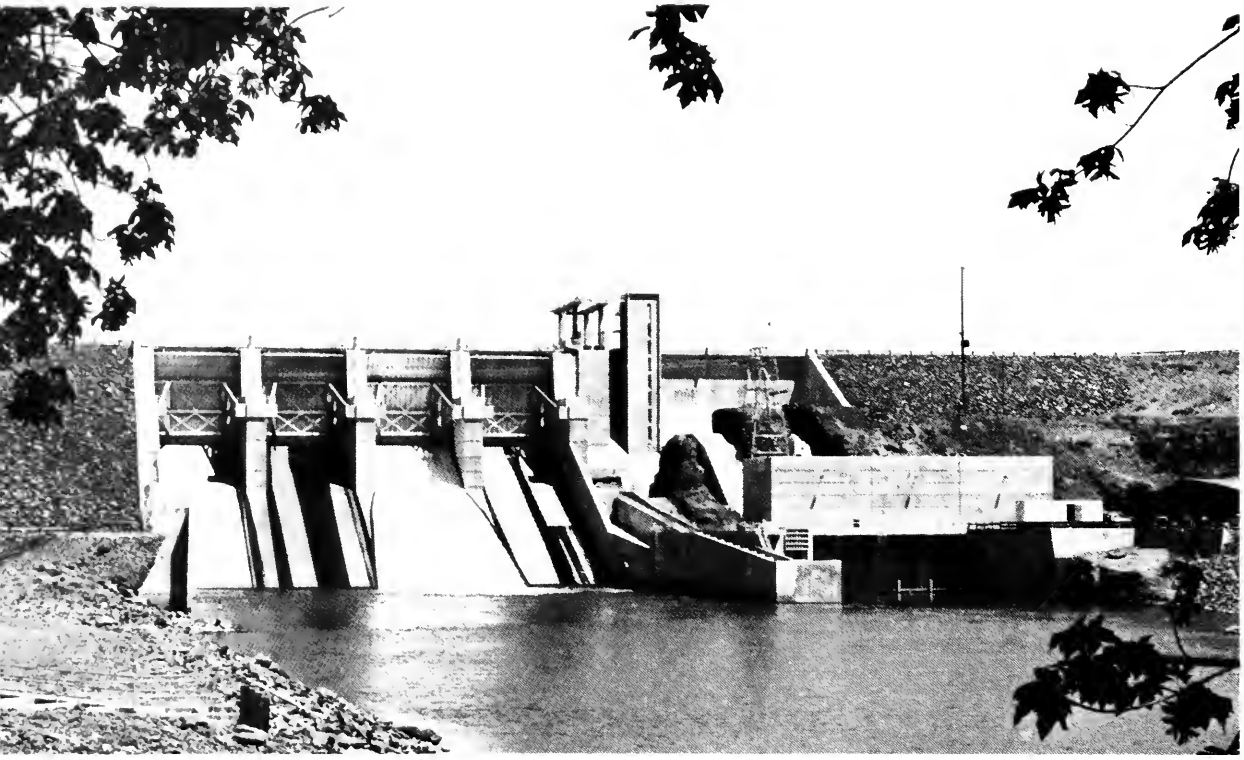
PURPOSE

Power
Recreation
Navigation
Flood Control
Power Storage
Irrigation
Water Supply





Recreation



41
Foster

South Santiam River, Oregon
Corps of Engineers
In service August 22, 1968
20,000 KW

PURPOSE
Power
Flood Control
Irrigation
Re-regulation for
Green Peter Dam

42
Green Peter

Middle Santiam River,
Oregon
Corps of Engineers
In service June 9, 1967
80,000 KW

PURPOSE
Power
Recreation
Navigation
Flood Control
Power Storage
Irrigation

43
Cougar

South Fork,
McKenzie River, Oregon
Corps of Engineers
In service February 4, 1964
25,000 KW

PURPOSE
Power
Recreation
Navigation
Flood Control
Power Storage

44

Dexter

Middle Fork, Willamette River, Oregon
Corps of Engineers
In service May 19, 1955
15,000 KW

PURPOSE

Power
Re-regulation for Lookout Point Dam

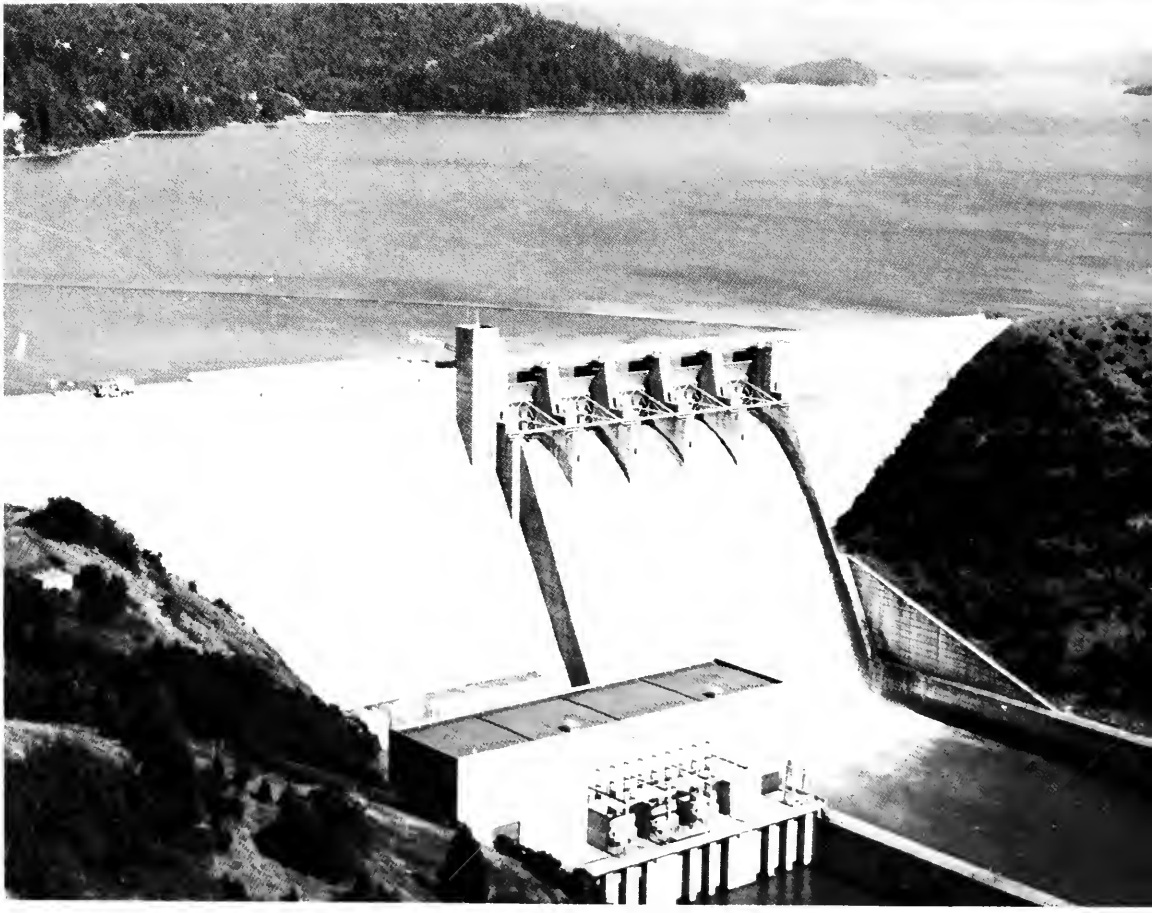
45

Lookout Point

Middle Fork, Willamette River, Oregon
Corps of Engineers
In service December 16, 1954
120,000 KW

PURPOSE

Power
Recreation
Navigation
Flood Control
Power Storage
Irrigation
Water Supply

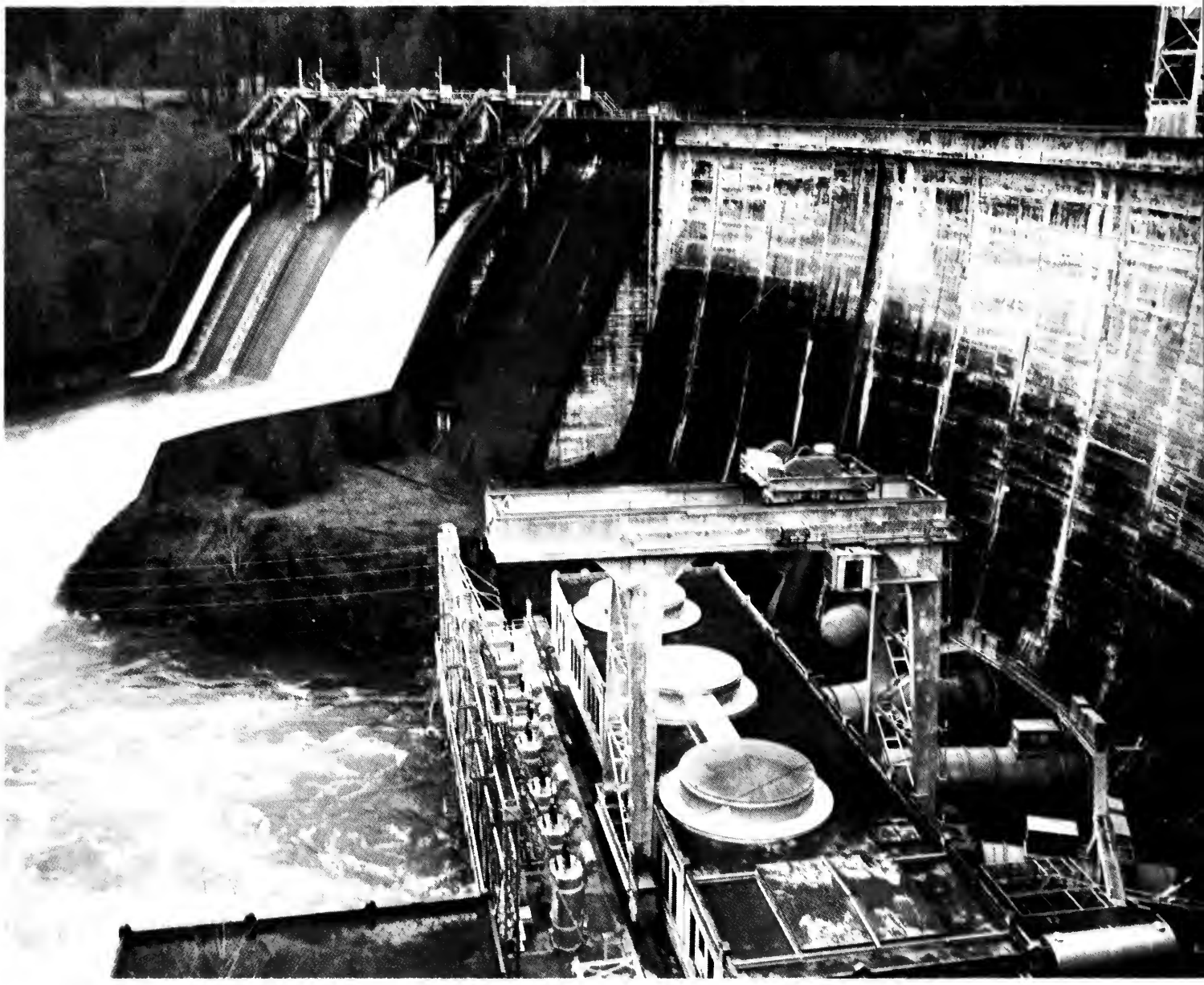


46 *Hills Creek*

Middle Fork,
Willamette River, Oregon
Corps of Engineers
In service May 2, 1962
30,000 KW

PURPOSE

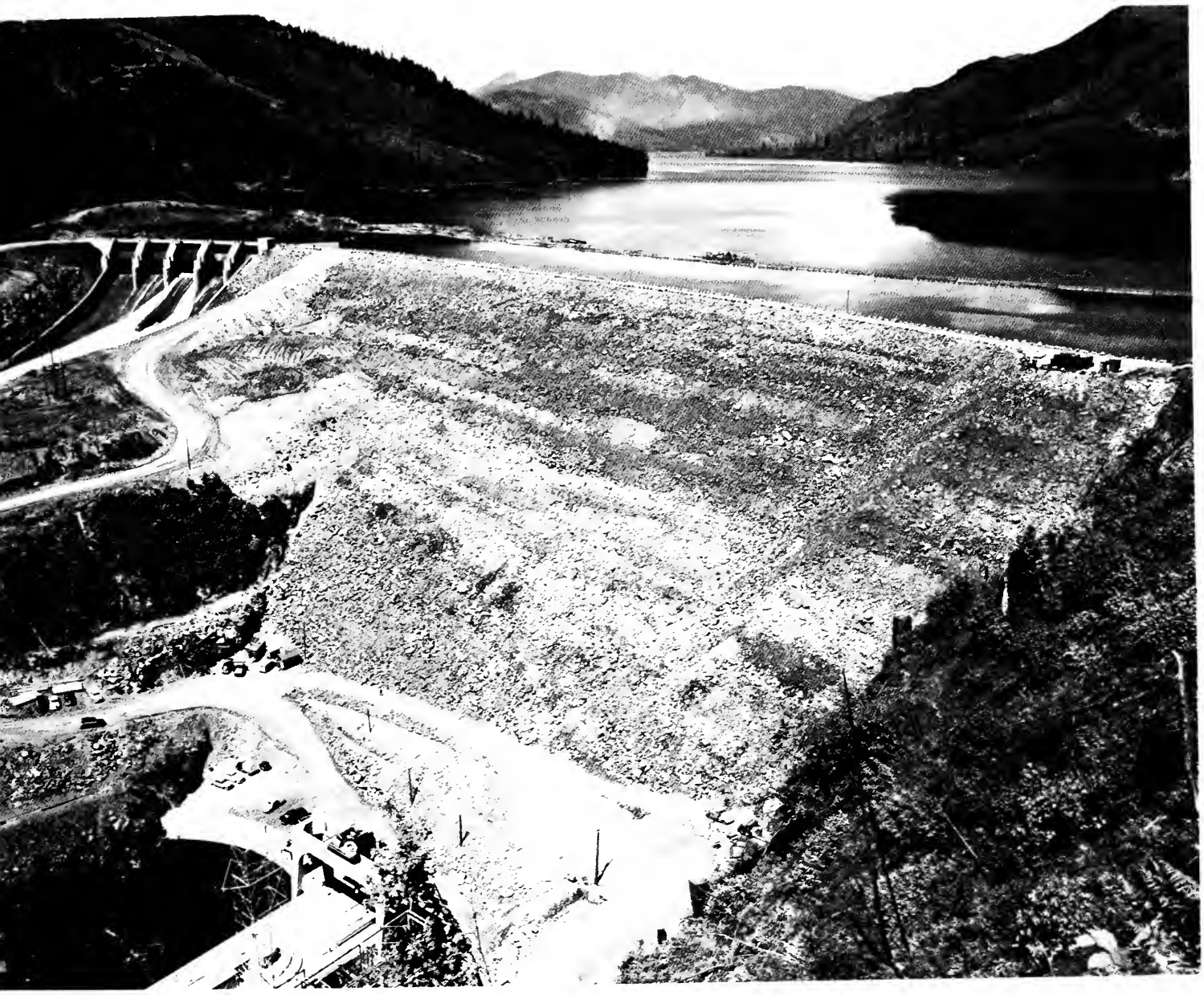
Power
Recreation
Navigation
Flood Control
Power Storage
Irrigation
Water Supply



47 Merwin

Lewis River, Washington
Pacific Power & Light Co.
In service September 8, 1931
135,000 KW

PURPOSE
Power
Power Storage



48 *Yale*

Lewis River, Washington
Pacific Power & Light Co.
In service September 7, 1953
108,000 KW

PURPOSE
Power
Power Storage

49
Swift no.1

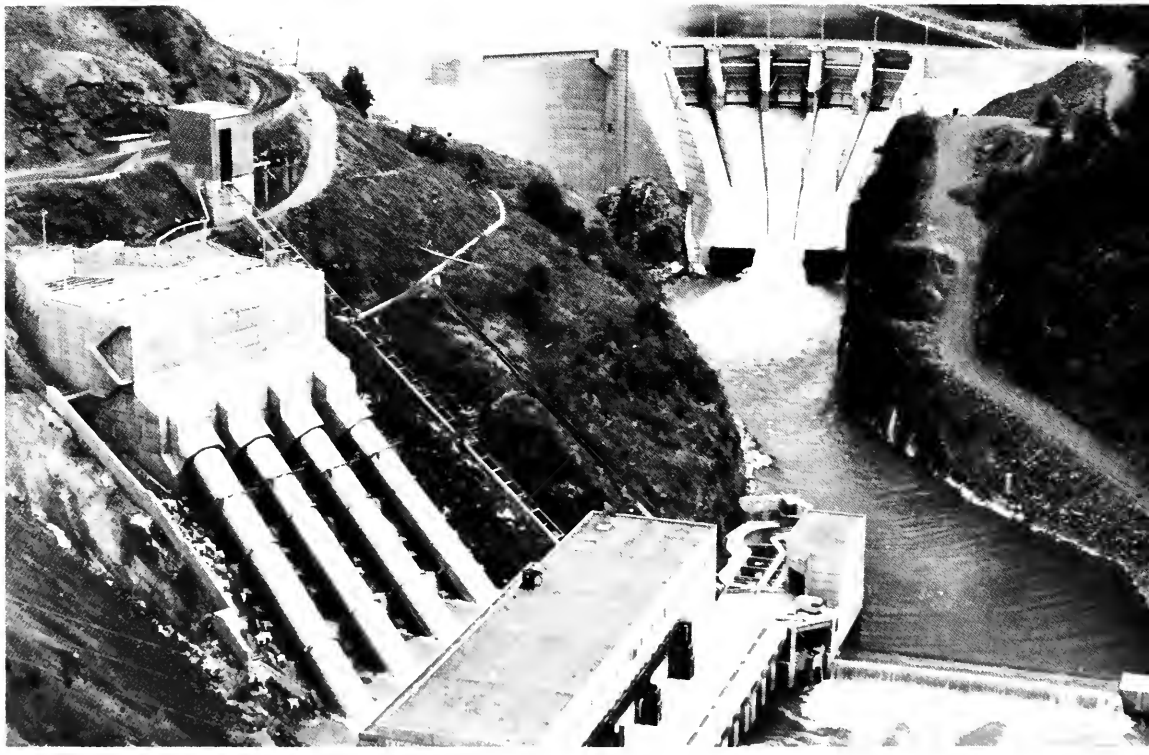
Lewis River, Washington
Pacific Power & Light Co.
In service December 31, 1958
204,000 KW

PURPOSE
Power
Power Storage

50
Mayfield

Cowlitz River, Washington
City of Tacoma
In service May 1, 1963
121,500 KW

PURPOSE
Power
Re-regulation for
Mossyrock Dam



51
Mossyrock

Cowlitz River, Washington
City of Tacoma
In service October 19, 1968
300,000 KW

PURPOSE
Power
Flood Control
Power Storage

52
Gorge

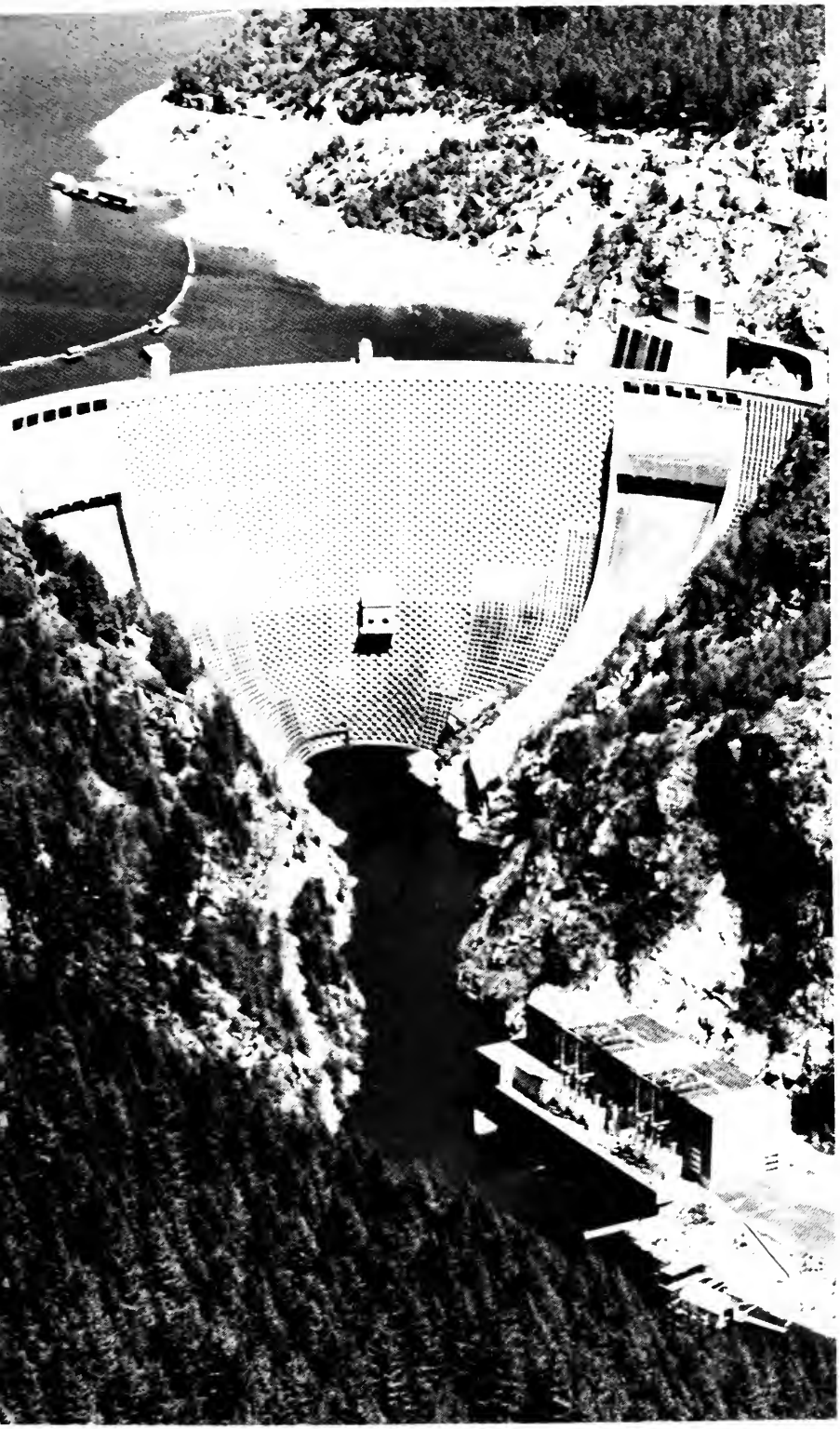
Skagit River, Washington
City of Seattle
In service 1924
137,700 KW

PURPOSE
Power

53 Diablo

Skagit River, Washington
City of Seattle
In service 1936
120,000 KW

PURPOSE
Power



54

Ross

Skagit River, Washington
City of Seattle
In service
December 30, 1952
360,000 KW

PURPOSE

Power
Flood Control
Power Storage

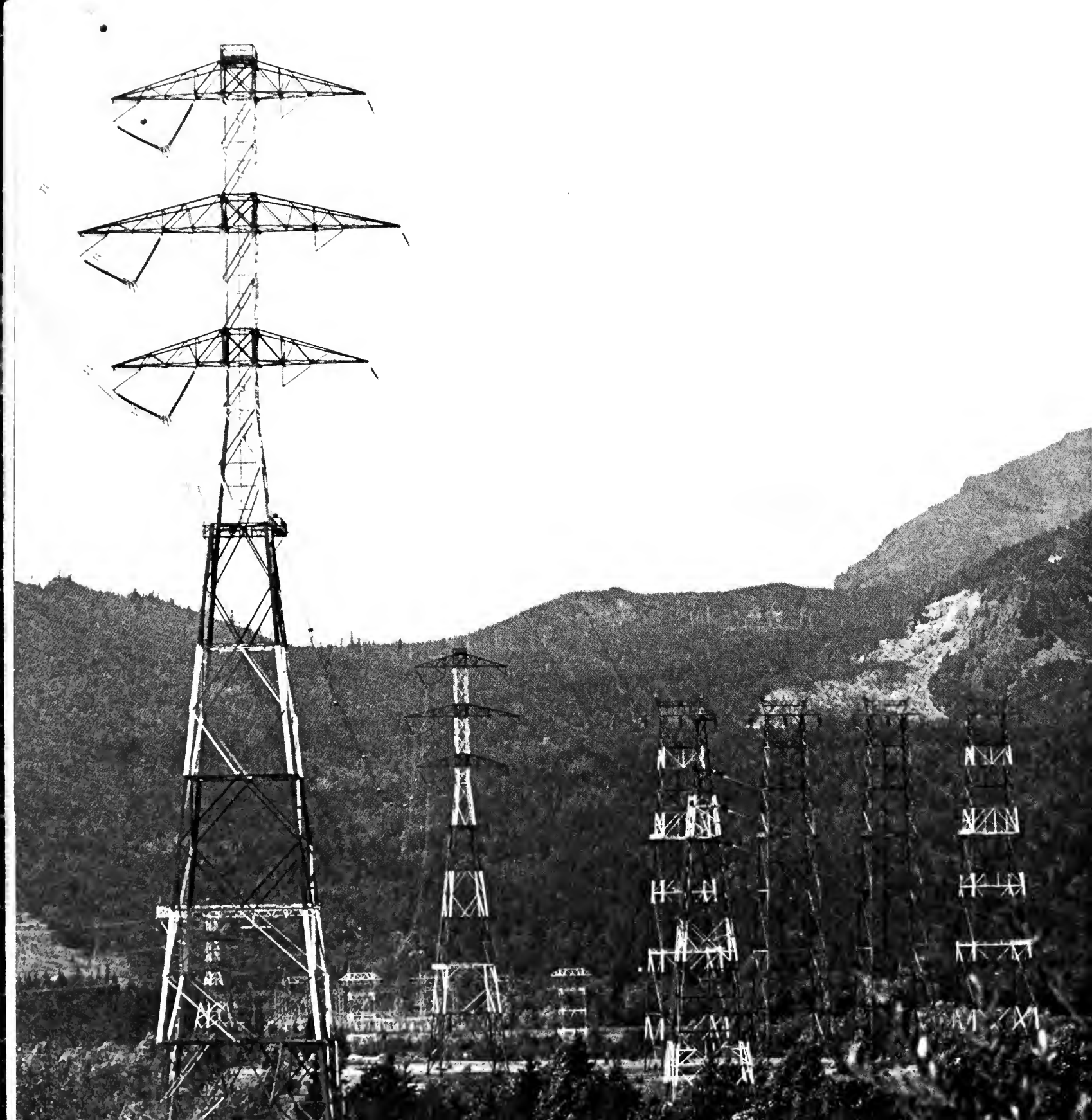
55

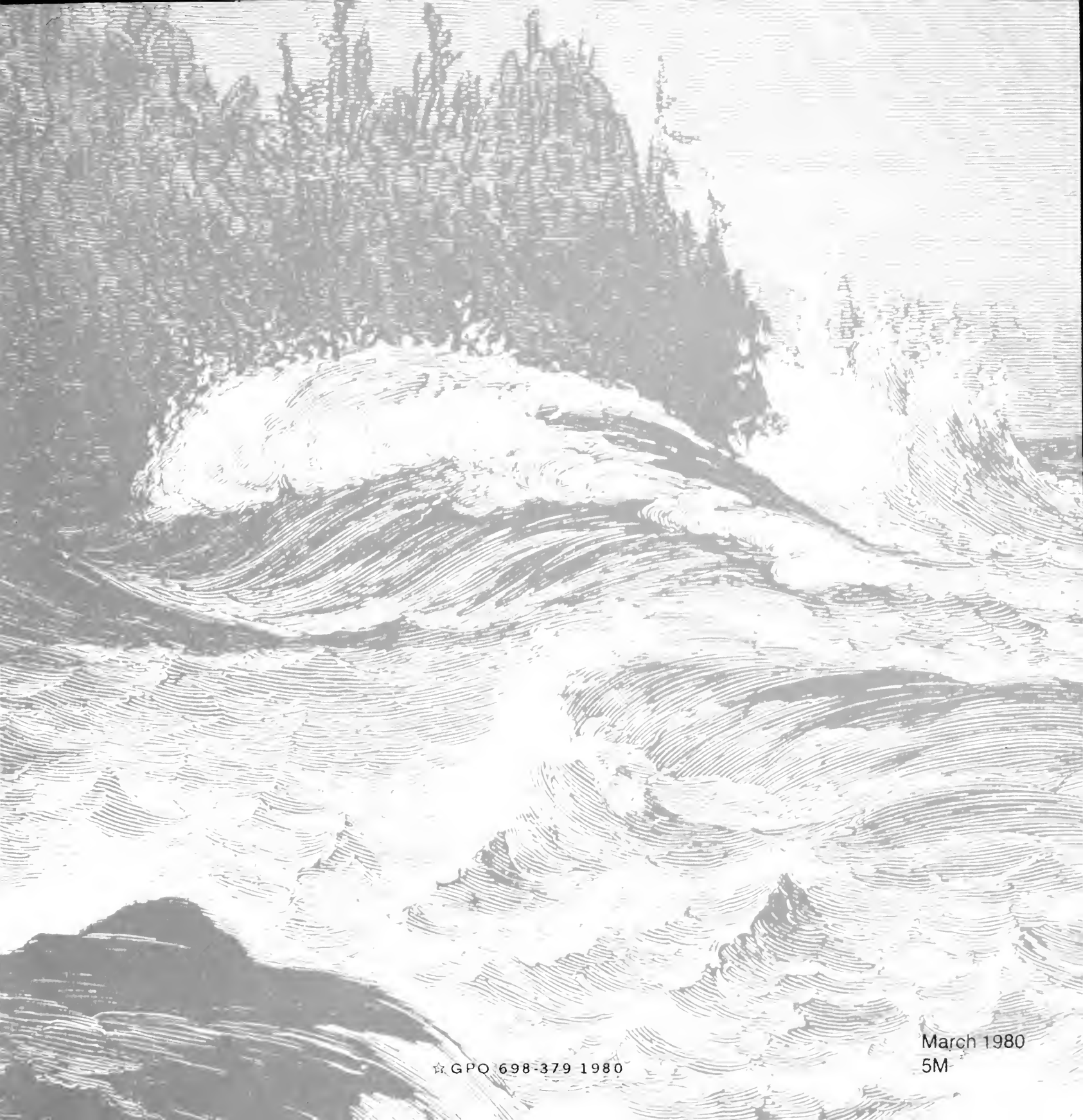
Lost Creek

Rogue River, Oregon
Corps of Engineers
In service
December 1, 1977
49.000 KW

PURPOSE

Power
Recreation
Flood Control
Power Storage
Irrigation
Water Supply





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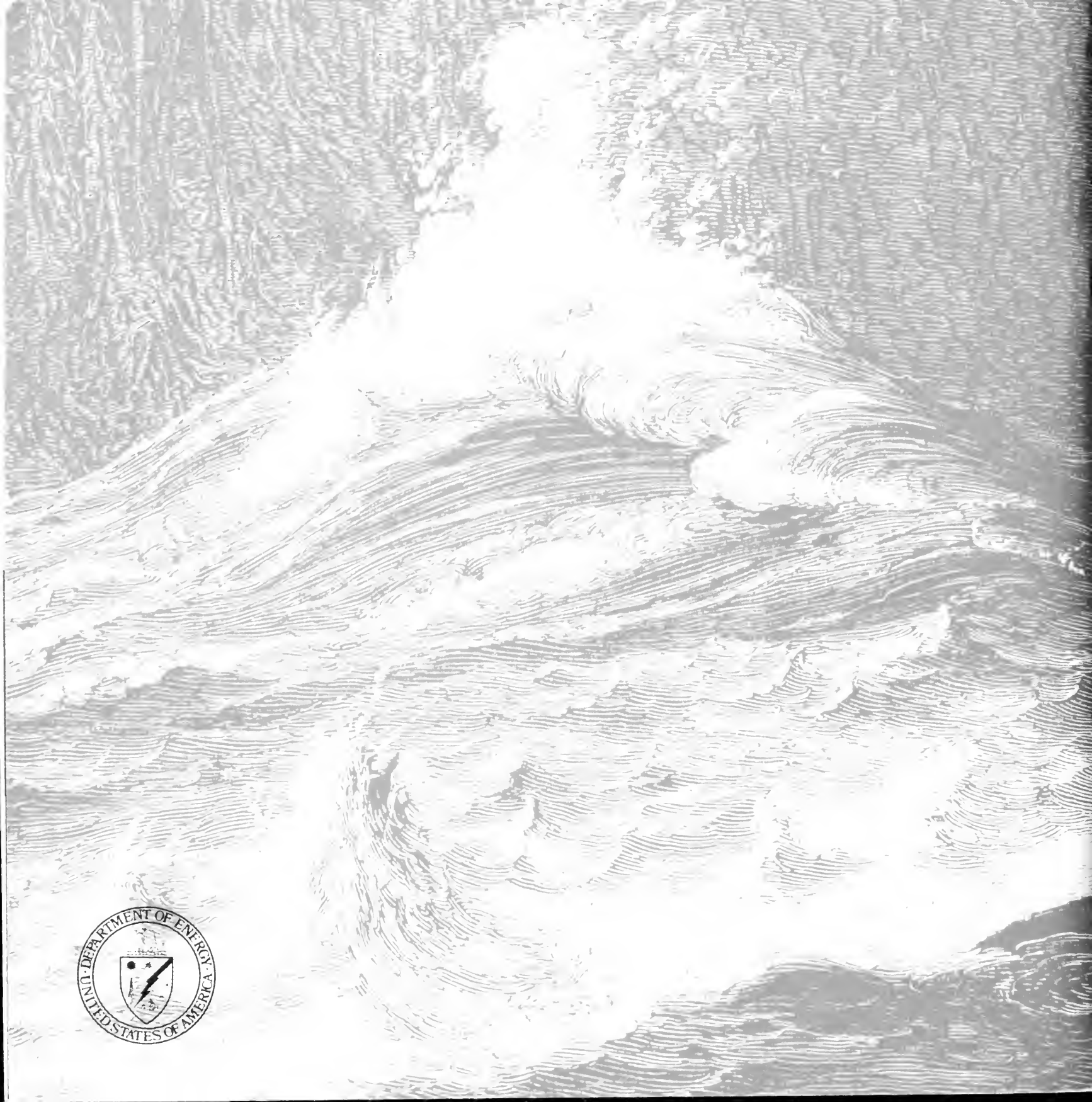
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UNITED STATES OF AMERICA